Service
Service
Service

HFC21

ServiceManual

HFC21

Is a compact Feature phone, and an integrated FAX machine combined with a Fax Switch. It is used as a "Personal Fax" replacing the existing phone without needing more space or additional telephone lines for facsimiles.

Published by Service Department Facsimile
©Copyright reserved Subject to modification
UK 4822 727 20413

PHILIPS

PCS 70701

TABLE OF CONTENTS

I INTRODUCTION

1 SAFETY PRECAUTIONS 1-2

1.1 IMPORTANT SAFETY PRECAUTIONS 1-2

1.2 ESD 1-2

1.2.1 General 1-2

1.2.2 Precautions to prevent ESD-damage 1-2

2 BASICS 1-3

2.1 ITU-T RECOMMENDATIONS 1-3

2.2 FUNCTIONAL BLOCKS 1-3

2.2.1 CIS Image sensor - electrical 1-3

2.2.2 CIS output waveform (video signal) 1-4

2.2.3 CIS Image sensor - mechanical 1-4

2.2.4 Converting into electrical signals (A/D conversion) 1-5

2.2.5 Datacompression - Reconstruction 1-5

2.2.6 Modulation - Demodulation 1-5

2.2.7 Types of picture signal modulation for facsimile 1-5

2.3 ITU-T PROTOCOLS (T30) 1-6

2.3.1 Time sequence of a facsimile call 1-6

2.3.2 Frame structure of binary signals 1-7

2.3.3 G3 Protocol procedure 1-7

2.3.4 Protocol-signals 1-9

2.3.5 Examples 1-10

3 FEATURES 1-12

3.1 FEATURE TABLE 1-12

3.2 DETAILED FEATURE DESCRIPTION 1-13

3.2.1 Telephone features 1-13

3.2.2 Dialling features 1-13

3.2.3 Transmission 1-14

3.2.4 Reception 1-14

3.2.5 FAX switch 1-15

3.2.6 Communication 1-16

3.2.7 Copy quality 1-16

3.2.8 Lists and Reports 1-17

3.2.9 Service features 1-18

3.2.10 Others 1-18

4 OPERATION ELEMENTS 1-19

II FUNCTIONS

5 GENERAL **2-2**

5.1 FUNCTION LIST **2-2**

5.2 COMPONENTS **2-3**

5.2.1 User/Service functions 2-3

5.2.2 Current settings 2-3

6 USER FUNCTIONS **2-4**

6.1 TABLE OF USER FUNCTIONS **2-4**

6.1.1 Set up 2-4

6.1.2 Communication 2-4

6.1.3 Faxswitch 2-4

6.1.4 Others 2-4

7 SERVICE FUNCTIONS **2-5**

7.1 ENTERING AND EXITING SERVICE MODE **2-5**

7.1.1 To enter the service mode: 2-5

7.1.2 To exit the service mode: 2-5

7.2 TABLE OF SERVICE FUNCTIONS **2-5**

7.2.1 Adjustments 2-5

7.2.2 Reconfigure 2-5

7.2.3 General tests 2-6

7.2.4 Tel. unit 2-6

7.3 DETAILED DESCRIPTION - SERVICE FUNCTIONS **2-6**

7.3.1 Adjustments 2-6

7.3.2 Reconfigure 2-9

7.3.3 General tests 2-12

7.3.4 Tel-unit 2-13

7.4 TABLE OF BSW AND NCU-PARAMETER **2-17**

7.4.1 BSW listing 2-17

7.4.2 NCU parameter listing 2-21

III SERVICE

8 REMOVALS 3-2

8.1 TOP COVER 3-2
8.1.1 Remove top cover 3-2
8.2 PGU 3-3
8.2.1 Remove hookswitch 3-3
8.2.2 Remove PGU 3-3
8.3 OPU 3-4
8.3.1 Remove OPU 3-4
8.3.2 Remove paperguide 3-4
8.4 MECHANICAL MODULE 3-5
8.4.1 Remove mechanical module 3-5
8.5 PCB'S 3-6
8.5.1 Remove LIU 3-6
8.5.2 Remove FCU 3-6

9 PCB - ARCHITECTURE 3-7

9.1 WIRING 3-7
9.2 BLOCK DIAGRAM 3-8
9.3 PCB DESCRIPTION 3-9
9.3.1 FCU - Fax control unit 3-9
9.3.2 LIU - Line interface unit 3-11
9.3.3 OPU - Operation panel unit 3-13
9.3.4 PGU - Power generation unit 3-13

10 TROUBLE SHOOTING 3-16

10.1 SERVICE REPORT 3-16
10.2 ERROR CODES 3-17
10.3 ERROR MESSAGES 3-19
10.4 PROBLEM LIST 3-20

11 TECHNICAL DATA 3-21

11.1 SPECIFICATION 3-21
11.1.1 General specifications 3-21
11.1.2 Communication quality 3-21
11.1.3 Scanning quality 3-22
11.1.4 Printing quality 3-22
11.1.5 Copy quality 3-22
11.1.6 Other features 3-23
11.1.7 Audible alarm 3-23

IV APPENDIX

12 PARTSLIST 4-2

12.1 MECHANICAL AND ELECTRICAL PARTS 4-2
12.2 CABLES 4-5
12.3 MANUALS 4-5
12.4 SOFTWARE 4-6
12.5 ESD-EQUIPMENT 4-6

13 GLOSSAR 4-7

14 INDEX 4-9

1 Introduction

In this chapter you can find

- important safety precautions
- basics about the technology of the fax machine
- the table of contents for all functions of the fax machine
- a detailed feature description
- descriptions about the operation elements

1 SAFETY PRECAUTIONS

1.1 IMPORTANT SAFETY PRECAUTIONS

1. The HFC21 is specificated as a Class II unit (ungrounded).
   All digital circuitry is connected to the potential of the Telecom line.
   That means: If you want to measure in the unit with connected Telecom line you have to use **ungrounded** measuring instruments. Otherwise it is possible that you shorten the Telecom potential to ground.
2. Service technicians must be made AWARE OF ESD and be GROUNDED!
   To avoid ESD risk you can order some ESD-equipment in the parts list
3. After each disassembly of the apparatus a high voltage test has to be performed.
   (3KV AC between mains and Telecom line)
4. **Attention**: The FCU Board contains a Lithium battery.
   Caution: Danger of explosion if the battery is incorrectly replaced.
   Replace only with the same or equivalent type, recomanded by the equipment manufacturer.
   Discard used batteries according to manufacturers instructions.

CAUTION!

Before opening the machine disconnect the mains cable.

Never remove the isolationplate from the PGU

- HIGH VOLTAGE! -

1.2 ESD

1.2.1 General

ESD is a spark jumping from one conductive surface, charged with static electricity to another conductive surface. This incredibly fast movement of static discharge (the charge can jump to that conductor in a nanosecond) can have disastrous consequences, especially for electronic circuitry.
We only feel ESD at a discharge of about 3.000 Volts.
However many semiconductors can be damaged by a discharge of just 60 Volts or less.
On non-conducting materials, such as plastics and textiles, charges remain stationary and cannot discharge and are therefore called static charges.
Static charges are brought in by people and are generated during their normal movements.

1.2.2 Precautions to prevent ESD-damage

Static electricity cannot be eliminated but it can be kept under control. Charging can be prevented by an appropriate grounding system for people and objects that may come into contact with the component or product.

TO PREVENT ESD KEEP THE FOLLOWING RULES:

1. All products being brought in for repair must be
   - processed in an ESD protected working area with an earthed dissipative mat.
   - kept in ESD protective packing material when not used.

2. People should wear a wrist strap and be connected to earth.

2 BASICS

2.1 ITU-T RECOMMENDATIONS

Communication must be possible between facsimiles of different manufacturers. If facsimile transceivers were built to conform to individual manufacturer standards, documents could not be transmitted between the fax-machines of different manufacturers.
With introduction of the ITU-T recommendations it is possible to send information from anywhere there is a telephone line, using any type of facsimile.

MAJOR RECOMMENDATIONS OF ITU-T (FOR FACSIMILES)

T.0: Facsimile classification for document transmission.
T.1: Standardization of G1 facsimiles.
T.3: Standardization of G2 facsimiles.
T.4: Standardization of G3 facsimiles.
T.30: Transmission procedures of G1, G2, G3 facsimiles.
T.35: Non standard facilities for G3 facsimiles.
V.21: Transmission of binary signals (300bps) for G3 facsimiles.
V.27ter: Characteristics of 2400bps and 4800bps modems.
V.29: Characteristics of 7200bps and 9600bps modems.

2.2 FUNCTIONAL BLOCKS

2.2.1 CIS Image sensor - electrical

During picture transmission by facsimile the transmitter scans the document to divide it into picture elements. The receiver reassembles the picture elements of the document and prints out a copy.

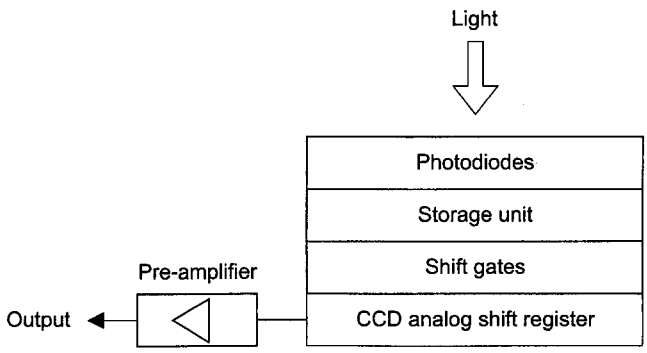
DIVIDING INTO PICTURE ELEMENTS (PIXEL)

Standard resolution (ITU - T)	Horizontal:	8,	pixel/mm
	Vertical:	3,85	lines/mm
Detail resolution (ITU - T)	Horizontal:	8	pixel/mm
	Vertical:	7,7	lines/mm

e.g.: "Standard resolution" (A4 - document):	Horizontal:	1.680	pixel
	Vertical:	1.143,5	lines
	Total:	1.920.996	pixel

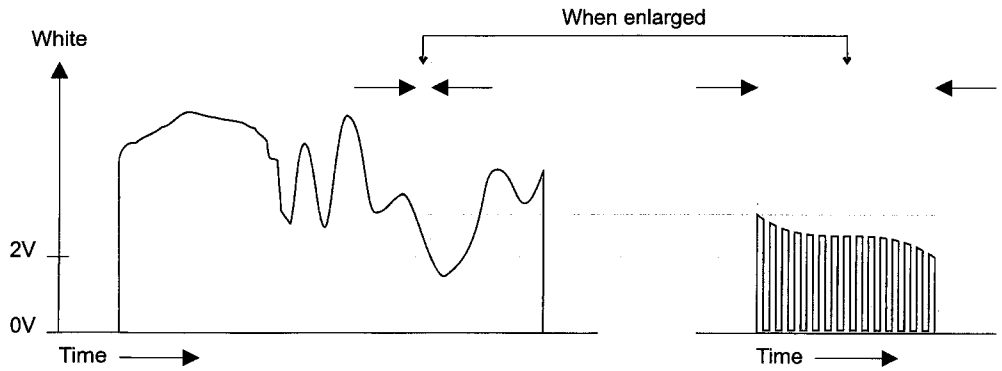
The original document (A4 size with standard resolution) is divided into 1.920.996 picture elements.

A CIS image sensor consists of photodiodes, storage unit, shift gates, analogue shift registers and a pre-amplifier. For reading A4 width documents **1680** photodiodes are arranged linearly on the CIS to generate charges when light is received.
The generated charges are sequentially shifted and converted into serial data by the built-in analogue shift registers. The picture information is read optical parallel and is given out as analogue electrical signal (video signal).



2.2.2 CIS output waveform (video signal)

This picture shows the CIS image sensor output when the sensor reads the document.

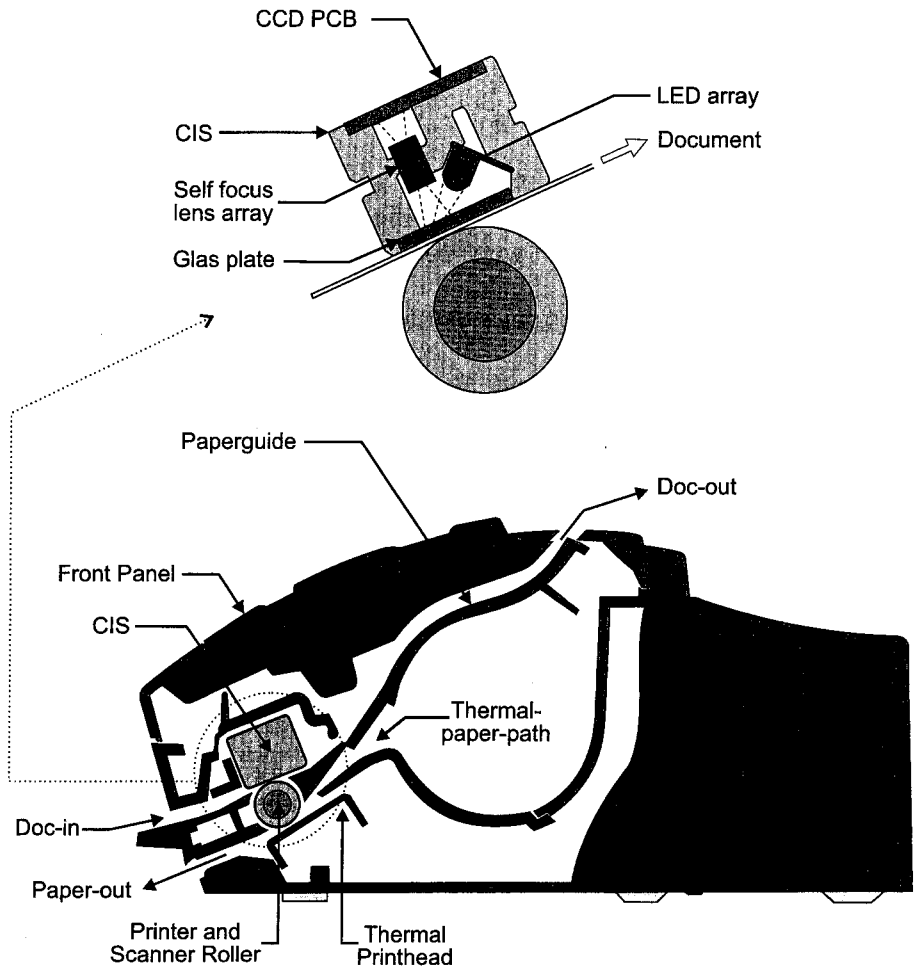


The enlarged CIS waveform reveals that the waveform consists of picture elements. The picture element is indicated in units of bits. The bits indicate analogue data because each bit represents a different voltage. This data can also be regarded as digital data in units of bits. Therefore CIS image sensor output can be considered both, digital and analogue output.

2.2.3 CIS Image sensor - mechanical

A CIS reads documents by dividing into the picture elements of full size (1:1), which provides the following features in comparison with the CIS image sensor:
- high sensitivity
- compact size

The contact image sensor is composed of a rod lens array and an LED array and minimizes the size of scanner unit.



2.2.4 Converting into electrical signals (A/D conversion)

The CIS image sensor converts one line of image data on the document into an electrical analogue signal containing serial data.
The analogue signals output from the CIS image sensor has a voltage of approx. 0,3V to 0,6V.
This signal is fed through the grey scale forming and threshold forming logic and is then amplified to a value of approx. 2,0V to 2,5V.

2.2.5 Datacompression - Reconstruction

A A4 size document is divided into approx. 4 million picture elements (detail resolution); this large amount of information has to be transmitted via the telephone line.
This would take a long time and would be very expensive.
Due to this reason datacompression is used in facsimile equipment.
There are two methods which are suggested from the ITU-T: One dimensional coding (MHC)
Two dimensional coding (MRC)

2.2.6 Modulation - Demodulation

It is not possible to send a digital signal over long distances via the telephone line.
The characteristics of the telephone line deform a digital signal which is transmitted over long distances so that it is impossible to re-construct the information.
This phenomenon appears also with analogue signals, but the deformation is not as heavy as with digital signals.
Demodulation is used to convert a modulated wave back into the original signal.
To convert a digital signal in an analogue signal (and vice versa) for transmission a modem is used.

2.2.7 Types of picture signal modulation for facsimile

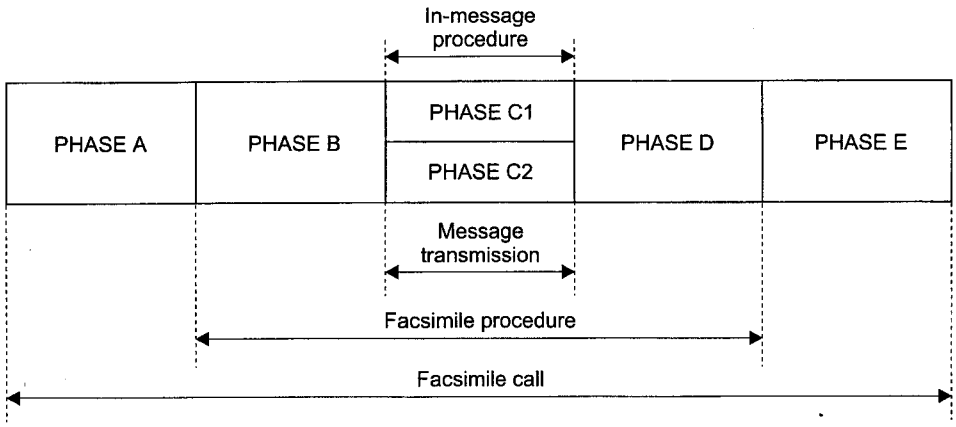
FM: The frequency of the carrier is changed in addiction to the digital signal.
ITU-T recommendations: G1(T2)
AM: The amplitude of the carrier is changed in addiction to the digital signal.
ITU-T recommendations: G2(T3)
PM: Only the phase of the carrier is changed in addiction to the digital signal.
ITU-T recommendations: G3(V27)
QAM: Uses phase and amplitude modulation.

G3 - FACSIMILES USES:

- for procedure signal (binary): Frequency deviation modulation-FSK (V21, T30)
- for picture signal: Differential phase modulation-PSK (V27, V29)

2.3 ITU-T PROTOCOLS (T30)

2.3.1 Time sequence of a facsimile call



PHASE A - CALL ESTABLISHMENT

Call establishment can be realised manually and/or automatically.

PHASE B- PRE-MESSAGE PROCEDURE

Identification section
Command section

PHASE C1 - IN-MESSAGE PROCEDURE

Takes place at the same time as message transmission and controls the complete signalling e.g.: synchronisation, error detection/correction, line supervision.

PHASE C2 - MESSAGE TRANSMISSION

Pixel transmission takes place.

PHASE D- POST-MESSAGE PROCEDURE

Includes information like:

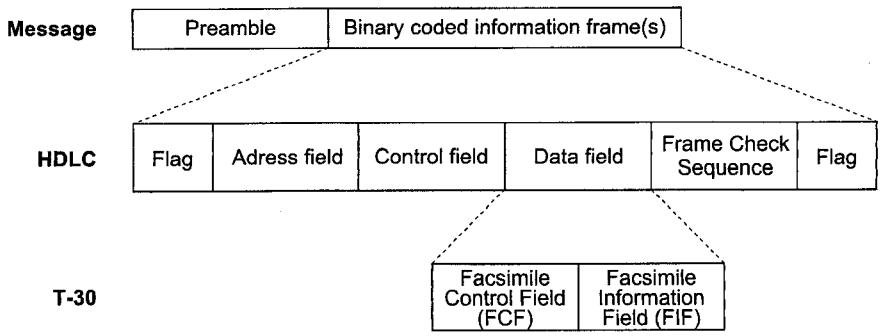
- end of message signalling
- confirmation signalling
- multiple page signalling
- end of procedure signalling

PHASE E- CALL RELEASE

Call release shall be realised manually and/or automatically.

2.3.2 Frame structure of binary signals

For a proof data transmission in the digital communication of facsimiles the HDLC - transmission protocol is used.



PREAMBLE

A series of flags for one second. Used for initial synchronisation of the modems.

FLAG

The flags are used for frame separation and for bit- and frame synchronisation.

ADDRESS FIELD

In case of transmission on PSTN lines this field is limited to a single format.

CONTROL FIELD

Is used for a unique coding and responses to the facsimile control procedures.

FACSIMILE CONTROL FIELD

Specifies the type of the frame.

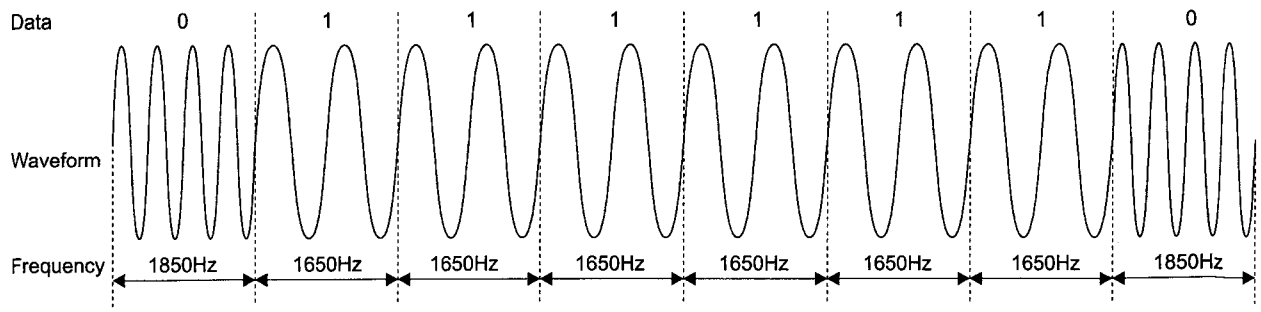
FACSIMILE INFORMATION FIELD

The HDLC information field is of variable length and contains specific information for the control and message interchange between two facsimile stations.

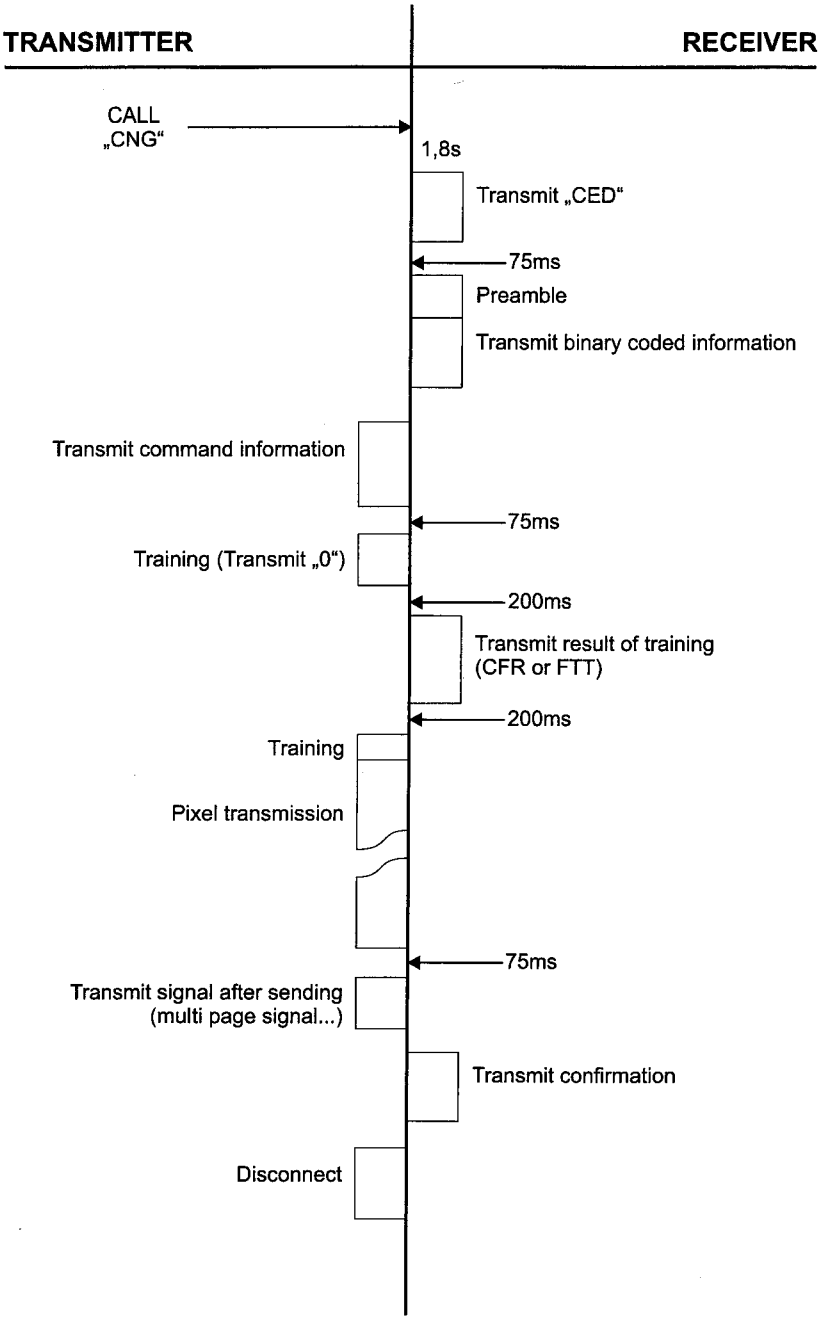
2.3.3 G3 Protocol procedure

TRANSMISSION OF BINARY SIGNALS

V21-modem:
Transmission speed: 300 bit/s
Frequency for "0": 1850 Hz
Frequency for "1": 1650 Hz



PROTOCOL PROCEDURE



2.3.4 Protocol-signals

AT BEGIN OF RECEPTION

Name	FCF	Description
CED		The called station is ready for reception (2100Hz one frequency signal).
DIS	10000000	The receiving machine informs the sending machine about receiving features (type of modem, receiving speed, paper size...).
NSF	00100000	This option is used to identify specific user requirements which are not covered by the ITU-T recommendations.
CSI	01000000	Provides the telephone number of the called station.

AT BEGIN OF TRANSMISSION

Name	FCF	Description
CNG		The calling station is ready for sending (1100Hz one frequency signal).
DCS	1000000x	Informs the receiving machine about transmission settings (type of modem, receiving speed, paper size...). This is the reponse to DIS.
NSS	0010001x	Answer to NSF.
TSI	0100001x	Provides the receiving station with the telephone number of the sending station.

DURING MODEM TRAINING

Name	FCF	Description
TRAINING		(V29 and V27)
TCF		Modem training-signal (a series of zeros for 1.5s).
CFR	1000010x	Informs the sending station, that the modem training succeed.
FTT	0100010x	Informs the sending station, that the modem training failed.

WHEN TRANSMISSION OF DOCUMENT DATA IS FINISHED

Name	FCF	Description
EOP	0010111x	Informs the receiving station the end of a page, and that no more pages will follow.
EOM	1000111x	End of a page - return to phase "B" (transmission of next pages will need new settings).
MPS	0100111x	Indicates the end of a page - return to phase "C" (more pages will follow).

RESPONSE AFTER RECEPTION OF DOCUMENT DATA

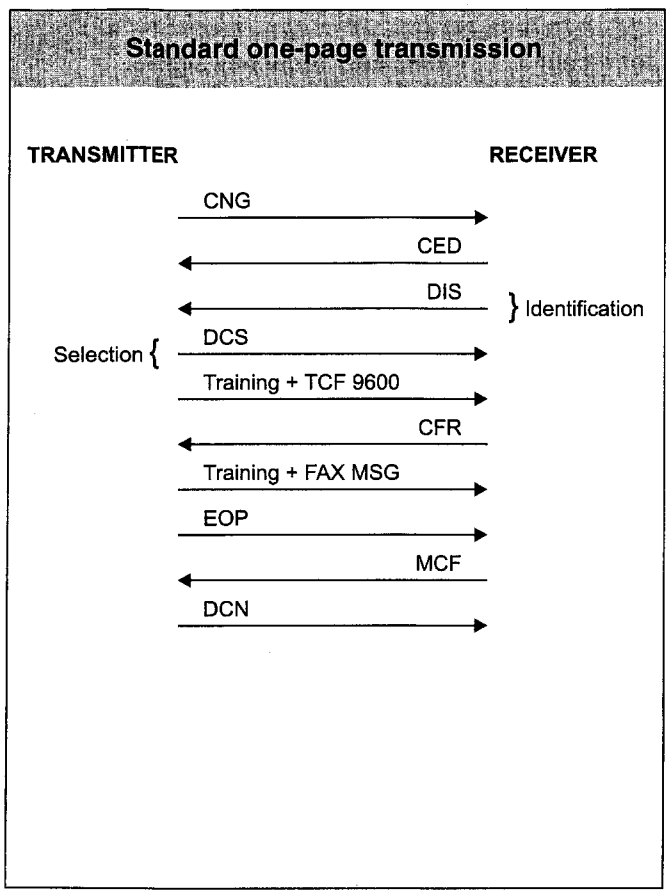
Name	FCF	Description
MCF	1000110x	A complete message has been received correctly - additional messages may follow.
RTP	1100110x	A complete message has been received correctly - additional messages requires training.
RTN	0100110x	A complete message has NOT been received correctly - additional messages may follow after re-training.
PIP	1010110x	Indicates reception of message but requires operator´s intervention for further transmission.
PIN	0010110x	Indicates unsatisfactorily reception of message; further transmissions are not possible without operator´s intervention.

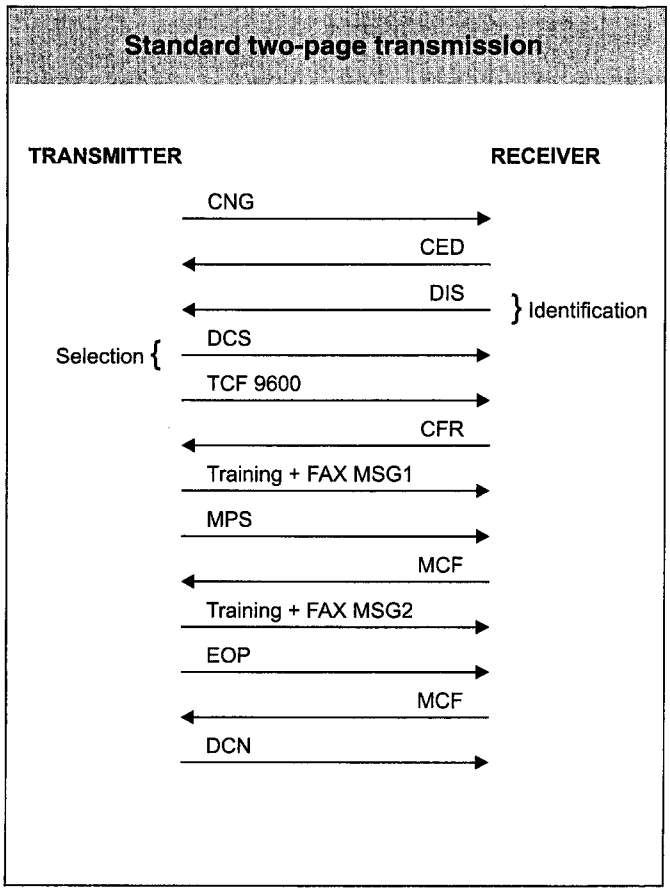
IF NECESSARY

Name	FCF	Description
CRP	0001101x	A request to repeat the previous command.
DCN	1111101x	Indicates the initiation of phase "E".

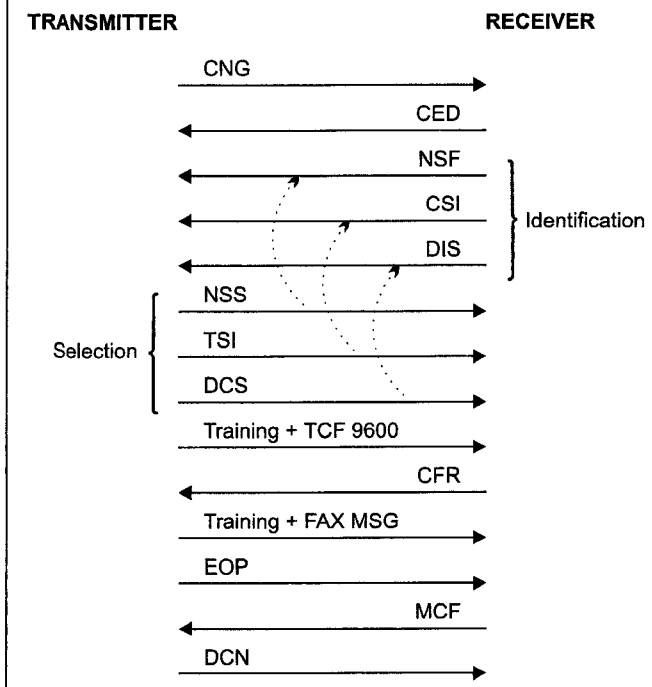
- FCF code "x" is 1 on this side which received DIS or NSF.
- FCF is transmitted from the "right side" (as written in this table).

2.3.5 Examples

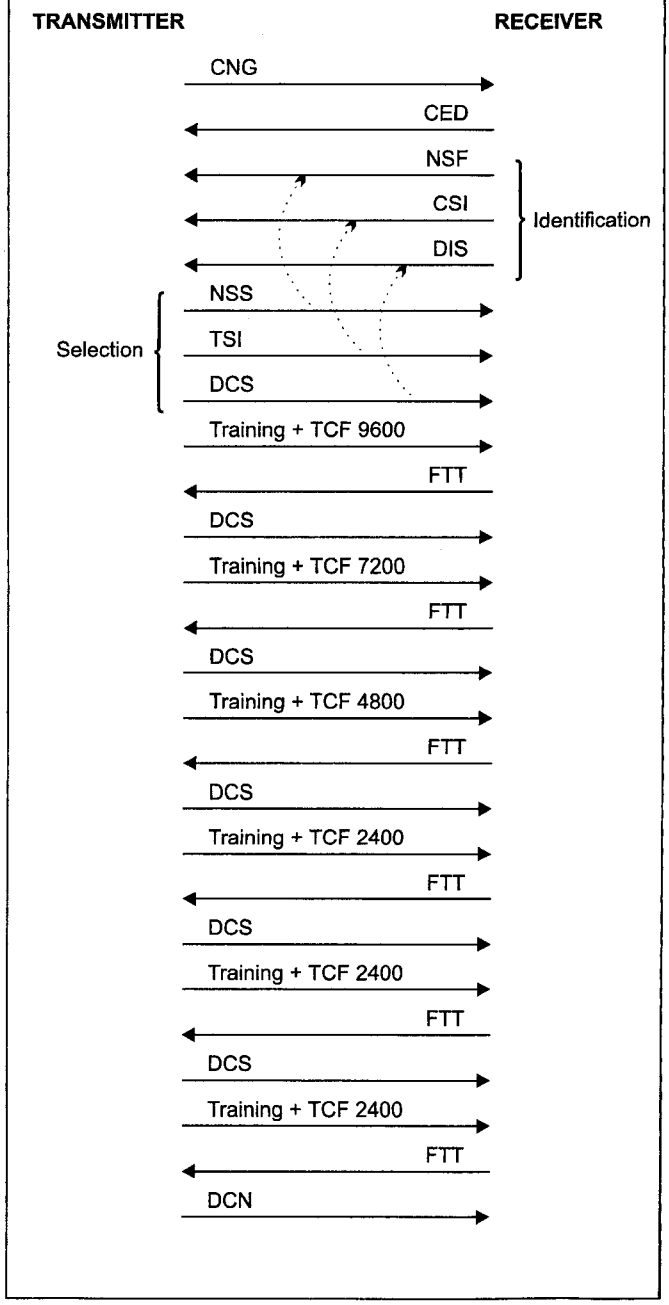




One-page transmission with sending of CSI and NSF



Down-training due to poor line conditons (worst case)



3 FEATURES

3.1 FEATURE TABLE

Some features are not available in certain countries.

Telephone features	
Built in handset	
12 key dial pad	
Ringer volume control	Digital
Recall	Common PABX Time Break function only
Pulse/tone dialing	User selectable
Power down function	Italy and UK only
Dialing features	
Automatic Redial	Auto only for fax; power up only
Manual Redial with redial Key	Only in power on mode!
Usage Code	Babysitter function
Transmission	
Automatic Transmission	
Manual Transmission	
Half Speed Transmission	
Detection of fax transmission from old machines	
Sending documents during a telephone call	
Voice request	Speaking after fax transmission
Faxing to sub-adresses	
Reception	
Automatic reception	
Manual reception	
Polling reception	
FAX switch	
Automatic TEL/FAX switch	
Remote fax start	from ext. phone with DTMF-Code (*5)
Ring back (440/700Hz)	BSW-selectable
Communication	
Page Header	includes TTI+Page
TSI / CSI	
Compression methods	MH / MR
Copy quality	
Transmission modes	Standard, Fine, Photo resolution
Automatic Background control	
Lists and Reports	
Transmission report	
Error report	
Service Report	
System report	Including BSW and NCU parameter settings
Function list	Including current setting list
SRAM data list	
LIU-Parameter list	
Scanner Reference Line - Printout	
Service features	
Remote diagnostics	
BSW setting	
NCU parameter setting	
SRAM data setting	
LIU-parameter setting	

Others	
Compatibility - G3	
Interface for external devices	eg. TEL, TAM, Modem...
Copy mode	fine/photo
Clock setting	
Language setting	
LCD size - 1x16 and a line of 6 icons	
ROM size -256 Kbyte	
Power Safe-Mode	see specification

3.2 DETAILED FEATURE DESCRIPTION

3.2.1 Telephone features

RINGER VOLUME CONTROL

The volume of the ringer can be adjusted by pressing the arrow left and right key. (4 times).

RECALL

To get access to the PSTN line in PABX systems ("Time break" function), to transfer a call within PABX systems or for special features at the PSTN-line.

PULSE/TONE DIALLING

Switchable during dialling via a key sequence (tone/pulse setting via user function 14).

POWER DOWN FUNCTION (ONLY ITALY AND UK)

For Italy during powerdown it's only possible to receive incoming calls.
The ringer volume is fixed.
For UK also dialling out is possible.

3.2.2 Dialling features

AUTOMATIC REDIAL

If a document should be sent and the dialled number is busy, the machine redials 3 times with a pause of 2 min. between the redial attempts (see also NCU #11/12).

MANUAL REDIAL WITH REDIAL KEY

Repeat the last dialled phone number.

USAGE CODE

Dialing is only possible after entering the usage code:
There are three different lock levels:

INT	International calls are not possible.
NAT	National calls are not possible (only local calls are possible).
TOTAL	When handset is lifted and any key is pressed a preprogrammed phonenumber will be dialed (babysitter function).

3.2.3 Transmission

AUTOMATIC TRANSMISSION

When a manual connection is made the fax message is transmitted automatically as soon as the machine recognizes another fax machine. You do not need to press START again.

MANUAL TRANSMISSION

If a connection is made and you recognize a fax machine you can start a manual transmission while inserting a document and pressing START.

HALF SPEED TRANSMISSION

The fax machine will automatically adjust its transmission speed to the quality of the telephone line. If the line quality is poor, this checking procedure will be slow. In this case it would be appropriate to set the machine to half speed transmission (4800bps).

DETECTION OF FAX TRANSMISSIONS FROM OLD FAX MACHINES

Old (silent) fax machines do not send a CNG signal, but remain silent. In order to receive fax messages from such fax machines, the fax machine starts reception after the selected ring count.

SENDING DOCUMENTS DURING A TELEPHONE CALL

By inserting the document and pressing the start-key its possible to send a fax at any time during a telephone call. During the transmission the call is interruptet.

VOICE REQUEST

Whilst sending a fax, lift the handset.
The other party will hear a ringing signal at the end of the fax transmission.

FAXING TO SUB-ADDRESSES

It's possible to send faxes to fax databases or poll from these.
Some databases have a sub-address which can be added to the telephone number.

3.2.4 Reception

AUTOMATIC RECEPTION

See section 3.2.5

MANUAL RECEPTION

If a call comes, you lift the handset and recognize a fax message then press START.
The transmission begins.

POLLING RECEPTION

The fax machine can fetch fax messages which have been prepared for collection from another fax. Polling codes work in accordance with the international ITU standard. However, there are manufacturers that use other processes and whose machines are therefore not compatible.

3.2.5 FAX switch

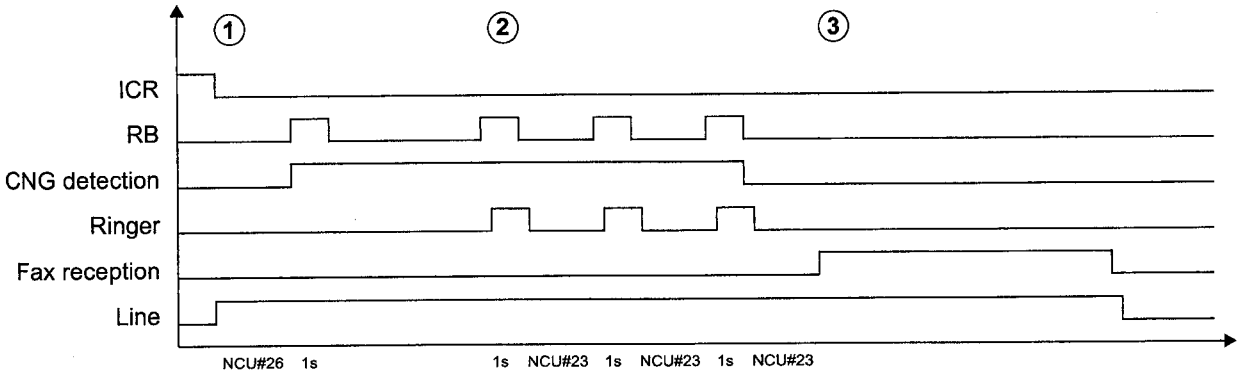
AUTOMATIC FAX SWITCH

TEL - mode

Telephone mode; acts like a normal telephone basically used for telephone calls only, a fax can be received by pressing START (if the handset is lifted).

TEL/FAX - mode

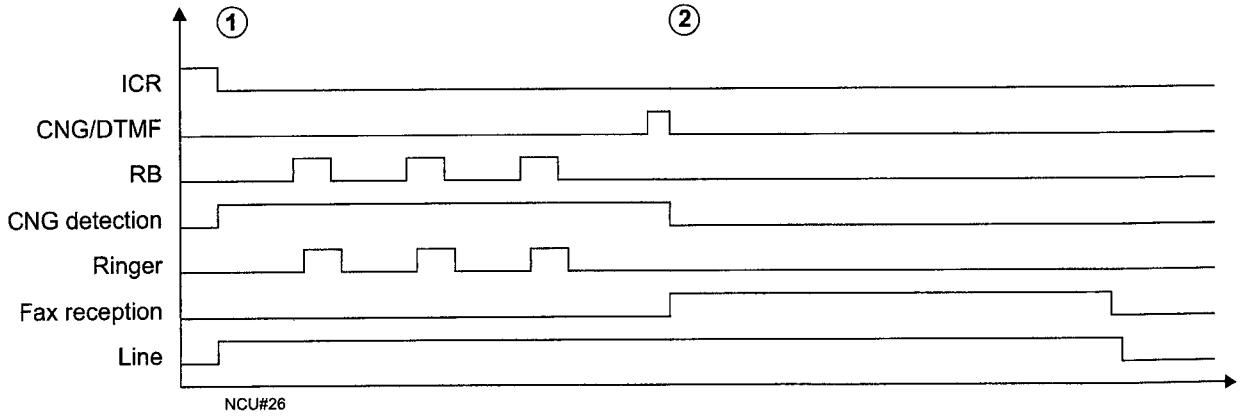
1. If a call comes in, the fax machine takes the line after the first ring (first ring is muted).
   The fax switch activates the CNG detection, in parallel it sends out a ring back signal.
   If a CNG signal is detected, fax reception is started (2CNGs).
2. If no CNG signal is detected within a few seconds the internal bell starts ringing.
3. If no CNG signal is detected and the handset is not lifted within a certain number of rings (user selectable) fax reception will be started.



EXT - mode

Ext. devices (e.g.: Tel, TAM...) are connected to the same telephone line (serial connection!).

1. If a call comes in, the fax machine and all ext. devices take the line (first ring is muted), CNG and DTMF detection is started.
2. After the selection ringcounts or if a CNG or a valid DTMF-sequence (*5) is detected, fax reception is started. There is no silence detection in this mode.



If an ext. TAM is used:
Set the ringcount of the fax machine higher than the ringcount of the ext. TAM.
To avoid a time out of the sending fax machine set the TAM to a low ring count (eg. 3).
Use a serial connection if possible.

REMOTE FAX START

It's possible to start fax reception from an external phone with a DTMF-sequence (*5).

RING BACK (440/700HZ)

With BSW O6/Bit5 the ringback tone can be changed.

3.2.6 Communication

PAGE HEADER

TTI and page number are printed on each fax that will be transmitted.
It is possible to turn off the page header.

TRANSMIT TERMINAL IDENTIFICATION (TTI)

Identifies the user's fax unit by including the name and fax number that has been programmed into the fax unit on the top of every page. This allows the receiving parties to easily identify the source of all documents being sent to them. FCC regulations also require that transmitted documents identify the sender's name, phone number, transmission date and time.

TSI / CSI

TSI: Identification (Tel. Nr.) of the transmitting machine
CSI: Identification (Tel. Nr.) of the receiving machine

COMPRESSION METHODS

Modified Hoffman: method to reduce the data transferred via the telephone line.
All G3 machines offer M.H.-coding.
Modified read: more efficient coding system that increases speed by about 15%.
M.R. is not available on cheap G3 machines.

3.2.7 Copy quality

TRANSMISSION MODES

standard: standard resolution, 3,85 lines/mm
fine: increased resolution, 7,7 lines/mm for transmission of detailed drawings or small characters
photo: fine resolution mode, 16 grey levels

AUTOMATIC BACKGROUND CONTROL

The background control (=intensity difference between the text and the background) is adjusted automatically.

3.2.8 Lists and Reports

TRANSMISSION/ERROR REPORT

Every time you send a document your fax machine prints a transmission report. If an error occurs during transmission you will be informed by the error report, which is printed out.

Examples for transmission - and error report

TRANSMISSION REPORT 17-SEP-96 9:07

FROM (OWNER):	43 1 60101 12345
TO:	43 1 60101 54321
PAGE (S):	2
DURATION:	0,26"
RESOLUTION:	STANDARD
RESULT:	OK

ERROR REPORT 17-SEP-96 9:09

FROM (OWNER):	43 1 60101 12345
TO:	43 1 60101 54321
PAGE (S):	2
DURATION:	0,21"
RESOLUTION:	STANDARD
ERROR ON PAGE (S)	1

SERVICE REPORT

Listing of occured transmission-errors... (see section 10.1)

SYSTEM REPORT

Listing of current settings including the BSW- and NCU parameter list (see section 7.3.2)

FUNCTION LIST

Listing of all functions including a current settings list (see section 5.1)

SRAM(MEMORY)-DATA LIST

Partial selectable listing of SRAM contents (see section 7.3.2)

LIU-PARAMETER LIST

Listing of all LIU-OTPROM data (see section 7.3.4)

SCANNER REFERENCE LINE - PRINTOUT

The scan. ref. line is a graph of the current CIS-condition (see section 7.3.1)

3.2.9 Service features

REMOTE DIAGNOSTICS

When this function is on, the service department can access some of your fax machine's technical data over the telephone line, and can bring rapid assistance.

BSW-SETTING

Change the Bitswitch settings (see section 7.3.2)

NCU-PARAMETER SETTING

Change the NCU-parameter (see section 7.3.2)

SRAM(MEMORY) DATA SETTING

Change the SRAM data (see section 7.3.2)

LIU-PARAMETER SETTING

Change the LIU-parameter (see section 7.3.4)

3.2.10 Others

COPY MODE

It's possible to copy document's in fine- and photo resolution.
Select the mode with RESOLUTION and press START.

CLOCK ADJUSTMENT

Set the clock if you want to transmit a correct fax header.

LANGUAGE SETTING

You can select the language in which messages are displayed and reports printed out. There is a choice of three (four; depends on software) languages.

POWER SAVE MODE

Power save is a mode where the machine has a power consumption less than 2W. To reach this low consumption, the machine must turn off most of the hardware components and goes in a special mode where only important events are checked.
The machine goes automatically in the power save mode, when the user has not made any action for the last 2 minutes and the machine is not in *idle* mode. (*Idle* mode: If the machine has currently nothing to do and waits for the next action and there is no action set for the next time - e.g. automatic redial)
This mode can be recognized by checking the " **:** " of the clock display.
In power save mode the colon stops blinking!

Error Led is flashing (no paper, paper jam,...)

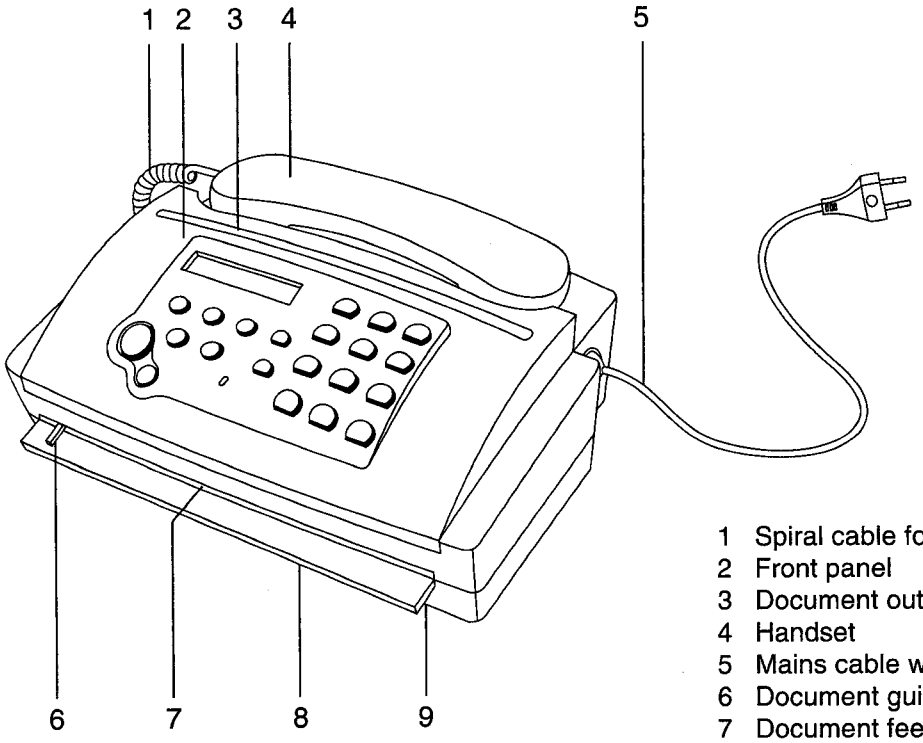
Actions during power save:

- Scanning the keyboard
- Updating the LCD (every minute)
- Updating the clock
- Checking the sensors
- Checking of incoming rings

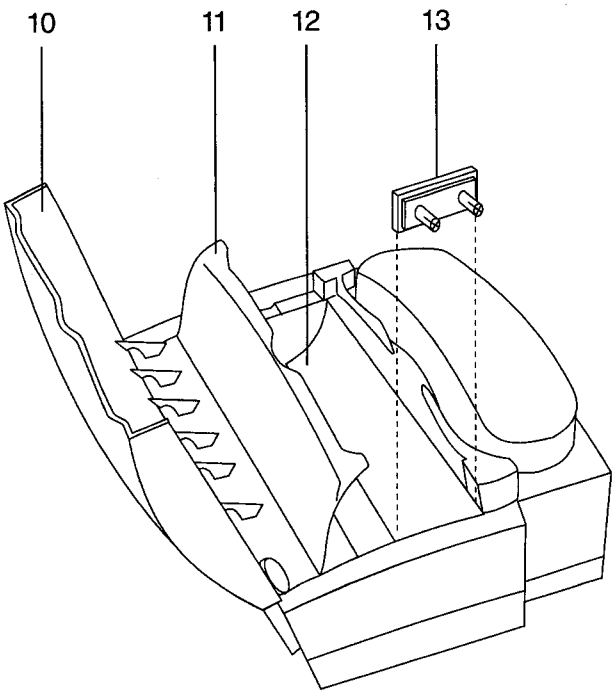
The machine will wake up from power save by following events:

- Key pressed
- Ring detected
- Document inserted
- Handset lifted
- External phone detected

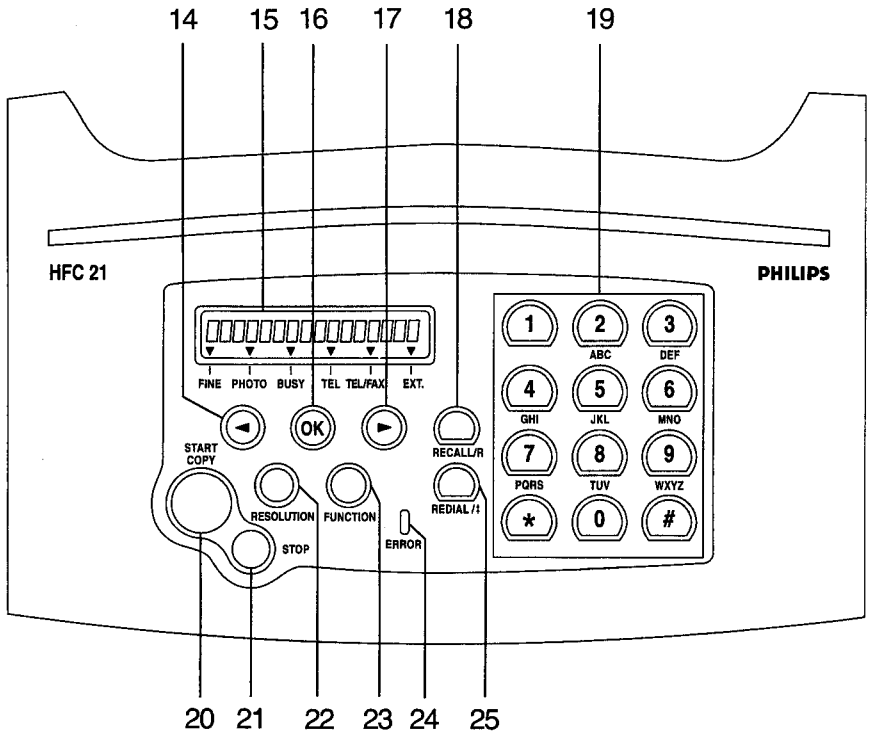
4 OPERATION ELEMENTS



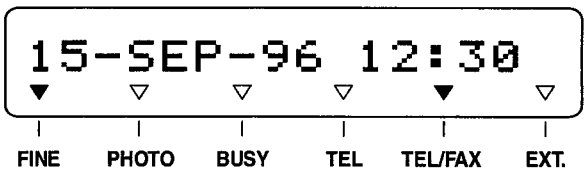
1 Spiral cable for the telephone handset
2 Front panel
3 Document outlet
4 Handset
5 Mains cable with power plug
6 Document guide
7 Document feed slot
8 Paper tear strip
9 Thermal paper outlet



10 Front panel
11 Paper guide
12 Paper compartment
13 Distance plate
(for 210 mm thermal paper rolls)



14 CURSOR LEFT: to move the cursor, to select options, to adjust the volume and to delete entries
15 Display (Remove the protection foil before use.)
16 OK key: to confirm entries
17 CURSOR RIGHT: to move the cursor, to select options and to adjust the volume
18 R key: for use with a private branch exchange (PABX) and advanced telephone company services
19 Dial pad for entering numbers and names
20 START/COPY key: to start transmission or to copy
21 STOP key: interrupts procedures
22 RESOLUTION key: to send and copy with higher resolution
23 FUNCTION key: to call up functions
24 ERROR indicator lamp
25 REDIAL key: to repeat the last number you have dialled, or to make a dialling pause



The pointers on the display indicate different modes:

FINE/PHOTO indicate whether you send or copy with a higher resolution or with grey tones. If none of the two is visible, the standard resolution is selected. To change the resolution use the RESOLUTION - key.

BUSY is visible if you are calling on an external phone on the same telephone line.

TEL, TEL/FAX, EXT. are three different modes to operate your fax machine. You can choose between the modes with function 31.

II Functions

In this chapter you can find

- a print out of the FUNCTION LIST
- short explanations about the USER FUNCTIONS (Detailed explanations you can find in the User Manual)
- descriptions how you enter and exit the SERVICE MODE
- short explanations about the SERVICE FUNCTIONS
- detailed explanations about the SERVICE FUNCTIONS

5 GENERAL

5.1 FUNCTION LIST

The function list is a summary of all user and service functions and includes additional current settings.
The structure of all functions is divided in two sections: User functions
Service functions

Example for the Function list (Service mode):

FUNCTION LIST

1 SET UP	2 COMMUNICATION	3 FAXSWITCH	4 OTHERS
11 SET DATE/TIME 12 YOUR TEL. NR. 13 YOUR NAME 14 DIAL MODE 15 SET LANGUAGE 16 PAGE HEADER 17 USAGE CODE	21 SLOW (4800BPS) 22 POLLED RECEP.	31 MODE 32 RING COUNT 33 EXT. PHONE	41 REMOTE OPER.
6 ADJUSTMENTS	**7 RECONFIGURE**	**8 GENERAL TESTS**	**9 TEL. UNIT**
61 MODEM TEST 62 DTMF TEST 63 OUTPUT LEVEL 64 FREQUENCY CHK 65 FACTORY ADJ. 66 SCANNER ADJ. 67 PRINT SCANREF	71 SYSTEM REPORT 72 SERV. REPORT 73 SET BITSWITCH 74 NCU PARAMETER 75 CHANGE MEMORY 76 PRINT MEMORY 77 DISPLAY FLAGS 78 DISPLAY RINGS 79 DISPLAY TESTS	81 RAM TEST 82 KEY TEST 83 LED TEST 84 LCD TEST 85 SPEAKER TEST 86 PRINTER TEST	91 LIU PARAM

CURRENT SETTINGS 15-SEP-96 12:30

YOUR NAME:
YOUR TEL. NR.:
DIAL MODE: TONE
PABX?: NO
RING COUNT: TEL/FAX EXT.
4 3
ROM VERSION: V0.25 BB DE

5.2 COMPONENTS

5.2.1 User/Service functions

THE USER FUNCTIONS CONTAINS THE CHAPTERS:

- Set up
- Communication
- Faxswitch
- Others

NOTE: To keep the use of the functions as simple as possible, they are grouped logically.
You can print out a list of all user functions by pressing the FUNCTION key twice and OK.

THE SERVICE FUNCTIONS CONTAINS THE CHAPTERS:

- Adjustments
- Reconfigure
- General tests
- Tel. unit

NOTE: If you want to print out a service function list or to use a service function,
it's necessary to go into the Service mode.

5.2.2 Current settings

For a prompt survey of all important informations there is add a Current settings list under the Function list.

THE CURRENT SETTINGS LIST CONTAINS:

- Your Name: Stored name (see function 13)
- Your Tel Nr.: Stored telephone number (see function 12)
- Dial mode: Selected dial mode (see function 14)
- PABX: PABX select - yes/no (see function 14)
- Ring count: Ring count in mode TEL/FAX and EXT. (see function 32)
- ROM Version: Software version, Country code...

6 USER FUNCTIONS

6.1 TABLE OF USER FUNCTIONS

6.1.1 Set up

Nr	Function name	Description
11	Set date/time	Adjust the internal clock to the current date and time. Date/time are shown on the display in idle state. This function is automatically invoked at power on. After power fail you have to set again. If you press STOP the display shows "DIAL/INSERT DOC."
12	Your Tel. Nr.	This number (CSI) is transmitted within the page header.
13	Your name	This name is transmitted within the page header.
14	Dial mode	To set dialmode and PABX operations.
15	Set language	Set language for display messages and report printouts.
16	Page header	The page header line consists of "Your Number" and "Your Name" and is printed on every transmitted page page header: on/off location: inside/outside image
17	Usage code	Dialling is only possible after entering the usage code.

6.1.2 Communication

Nr	Function name	Description
21	Slow (4800bps)	Half speed transmission (4800 baud: ON/OFF)
22	Polled reception	To call another station and receive a document
26	Paper save	Reduce the height of the receiving document to save paper provided that the document is sent in standard mode.
27	Mercury	There are two services of MCL, the residental C132 and the 2300 service which can be accessed via most BT-lines. (for UK only)

6.1.3 Faxswitch

Nr	Function name	Description
31	Mode	To set the Modes TEL, TEL/FAX and EXT.
32	Ring count	Ring count in TEL/FAX-mode
33	Ext. phone	To set EXT. mode operations

6.1.4 Others

Nr	Function name	Description
41	Remote operation	To enable remote diagnostic access (default: disable)

7 SERVICE FUNCTIONS

7.1 ENTERING AND EXITING SERVICE MODE

7.1.1 To enter the service mode:

(Handset on hook)
Press START, STOP, START, STOP, START within 3 seconds

7.1.2 To exit the service mode:

Press STOP twice in each function, to go standby mode. The FUNCTION key toggles between special functions in a group. After timeout (40 sec), the system will switch SERVICE FUNCTION MODE off.

NOTE: For service functions the keys LEFT, RIGHT, OK, *, #, START and STOP are used.
For setting of hexadecimal values a Shift-key (R-KEY) must be held down and 0.5 keys must be pressed to enter A...F.

HEX	A	B	C	D	E	F
Rkey &	0	1	2	3	4	5

7.2 TABLE OF SERVICE FUNCTIONS

7.2.1 Adjustments

Nr	Function name	Description
61	MODEM Test	To check the correct function of the modem-chip (external measuring instrument needed).
62	DTMF Test	To check the correct function of the telephone microcontroller (external measuring instrument needed).
63	Output Level	FACTORY USED ONLY
64	Frequency Chk	To generate and output a sine wave with selectable frequency (100 Hz steps) at the defined output level.
65	Factory Adj.	1.) To check software and country version. 2.) To set correction value for the output level (external measuring instrument needed). 3.) To make a SRAM clear and reset (all RAM contents are set to default).
66	Scanner Adj.	Used to check the correct function of the LED-array.
67	Print Scan Ref	Used to check the CIS.

7.2.2 Reconfigure

Nr	Function name	Description
71	System Report	Prints out the current system parameters. Used before changing battery or replacing FCU.
72	Service Report	Prints out the most recent 15 error codes. Used before changing battery or replacing FCU.
73	Set Bitswitch	Used to change bit-switch settings.
74	NCU Parameter	Used to adjust parameters for dialling and timing detection.
75	Change Memory	Used to check or change the RAM/ROM contents.
76	Print Memory	Used to print out a certain memory area.
77	Display Flags	FACTORY USED ONLY
78	Display Rings	FACTORY USED ONLY
79	Display Tests	FACTORY USED ONLY

7.2.3 General tests

Nr	Function name	Description
81	RAM Test	To test correct function of RAM.
82	KEY Test	To test correct function of all keys.
83	LED Test	To test correct function of all LED's.
84	LCD Test	To test correct function of the LC-Display.
85	SPEAKER Test	To test correct function of built in speaker.
86	PRINTER Test	To test correct function of the thermal head.

7.2.4 Tel. unit

Nr	Function name	Description
91	LIU PARAM	To specify the functionality of the LIU-parameters.

NOTE: Do not use service functions 77, 78, and 79; they are only for factory use. If used, the machine might do a SRAM clear !!

7.3 DETAILED DESCRIPTION - SERVICE FUNCTIONS

1. Enter the service mode (see section 7.1.1).
2. Select the function with the numeric keypad or the keys LEFT and RIGHT.
3. Press OK.

7.3.1 Adjustments

MODEM TEST - FUNCTION 61

This function permits to send a specified frequency or baudrate to the telephone line for measuring purposes (9600,7200,4800,2400,300 Baud 1100,2100 Hz).

1. Enter the service function (see section 7.3).
   The machine goes on the line.
2. By pressing one of the keys (* and #) the user can define which signal is output by the modem chip.
   The LCD shows the specified frequency or baudrate.

DTMF TEST - FUNCTION 62

This function permits to send a specified DTMF signal to the telephone line for measuring purposes.

1. Enter the service function (see section 7.3).
2. By pressing one of the numeric keypad (0-9,* and #) the user can define which DTMF signal will be sent out by the telephone microcontroler to the telephone line. The DTMF signal is also sent to the speaker. To dispatch a continuous DTMF tone, the DTMF continuous mode bit in LIU PARAM. must be set (tone is sent as long as key pressed).
   Switch the machine OFF/ON, to activate the new function.

OUTPUT LEVEL - FUNCTION 63

This function permits to change and define the output level for sending signals (CNG, CED, FSK and high speed pixel data) to avoid a telephone line problem.

1. Enter the service function (see section 7.3).
2. By pressing one of the keys (* and #) the user can define the output level (in 1dB steps), it is also shown on the right corner of the LCD and is stored immediately. (Range: 0dB ... - 15dB).

NOTE: The real range for the output level depends on PTT requirements for each country.

FREQUENCY CHECK - FUNCTION 64

This function permits to send a definable frequency to the telephone line and the speaker. The frequencies can be set in 100 Hz steps with a defined output level.

1. Enter the service function (see section 7.3).
2. Press LEFT to select send.
   With * and # the user can define the sending frequency with the specified output level.
3. Press RIGHT to select receive.
   Receive tests which digital filters are active.

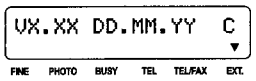
FACTORY ADJUST - FUNCTION 65

This function consists of two levels. The first level gives SW-informations about the version number, creation date and country code. The second level permits to set the correction value for the OUTPUT LEVEL or to make a RAM CLEAR if necessary.

NOTE: Make a print out of the system report (service function 71) and the dialling list (user function 52) before doing a RAM clear.

1. Enter the service function (see section 7.3)

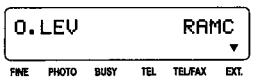
   The LCD shows:

   X = Software version
   D = Day
   M = Month
   Y = Year
   C = Country

2. Press Start

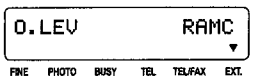
   The LCD shows:

3. Press LEFT to select "Output Level"
   With * and # the user is able to adjust the correction value for the output level (range from 1..255).

4. Press RIGHT to select "RAM Clear"

   The LCD shows:

   If START key is pressed, a soft reset is performed, which includes a whole ARAM test and a SRAM clear. After reset all soft bitswitches and NCU parameters are set to the initial default values.

WARNING!

The complete RAM will be cleared, that means all CSI and changed BITSWITCHES and NCU parameters will be erased.

SCANNER ADJUST - FUNCTION 66

Use this function to check the correct functioning of the scanner LED array.

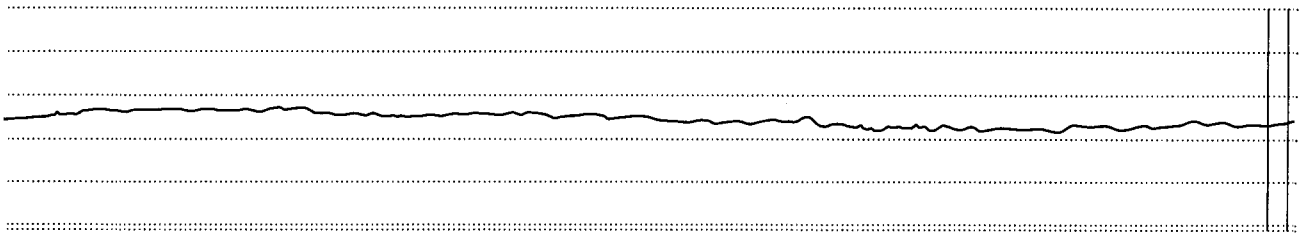
1. Enter the service function (see section 7.3).
2. Press ENTER - the CIS-LED array is on.
3. Press STOP - the SCANNER LED array is off.

PRINT SCANREF - FUNCTION 67

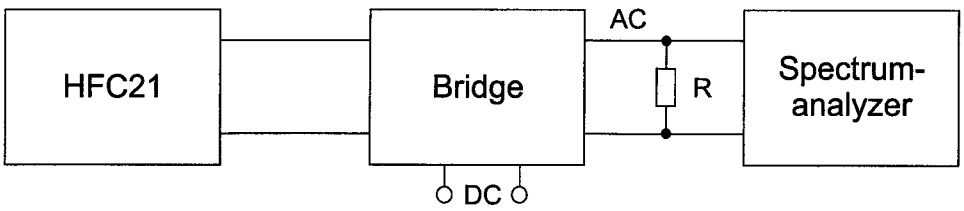
Use this function to check the CIS via print out of the scanner reference line
The reference line is a diagram of the correction values which are used for the auto shading correction.
If the line comes close to the top level or if there are significant peaks it indicates problems with the CIS.
Clean the scanner roller and the scanner or replace the CIS. Test scanner performance by making a test copy in photo mode. There shall not be significant vertical dark stripes.
Whenever a document is inserted, the background control is performed using the scanner roller as the white reference.

1. Enter the service function (see section 7.3).
2. Insert a white document slowly and remove it again.
3. Press ENTER - the scanner ref. line is printed out.

Example for a Scanner reference line:



Blockdiagram for the measurements of functions 61-64



The value of R is depending on the spectrumanalyzer.

7.3.2 Reconfigure

SYSTEM REPORT - FUNCTION 71

Use this function to print the actual system parameters like TTI, CSI, ROM/LIU-Version, CCITT number, Maker code, Country Version, Bit switches and NCU parameters.
If possible, print out this list before repairing or replacing the FCU and before refilling the system parameters.

1. Enter the service function (see section 7.3).
2. Press ENTER - The system report list will be printed now.

Example for a System report:

SYSTEM REPORT

```
YOUR NAME:
YOUR TEL. NR.:
ROM VERSION:       V0.25 BB 09.07.96 12:06   DE 060 01 0   L00 432
LIU VERSION:       V01 D F
CCITT/MAKER:       A/1
OUTPUT LEVEL:      -09DBM

BITSWITCH   DEFAULT   ACTUAL     BITSWITCH   DEFAULT   ACTUAL
       00  00000010   00000010          0A  00000000   00000000
       01  00000000   00000000          0B  00001000   00001000
       02  00001001   00001001          0C  00001110   00001110
       03  00011000   00011000          0D  10000000 * 11000000
       04  01000000   01000000          0E  11000000   11000000
       05  00011000   00011000          0F  00100101   00100101
       06  00001000   00001000          10  00110000   00110000
       07  00011100   00011100          11  00000000   00000000
       08  01001011   01001011          12  10000010   10000010
       09  00001000   00001000          13  00001100   00001100

NCU PARAM.    DEFAULT    ACTUAL     NCU PARAM.   DEFAULT    ACTUAL
     0/00     42/2A      42/2A          48/30    32/20      32/20
     1/01    150/96     150/96          49/31     3/03       3/03
               "          "               "        "          "
    47/2F     32/20      32/20          95/5F    85/55      85/55
```

Line "ROM VERSION" means:

e.g.:	SW-Version	Country Set	Date	Time	LIU-Country	OPU-configuration	Factory code	ARAM-amount	LIU-code	Built Nr.
	V0.25	BB	09.07.96	12:06	DE	060	01	0	L00	432

Line "LIU VERSION" means:

e.g.:	SW-Version	Dialmode	R-key
	V01	D (DTMF)	F (TIME BREAK)
		P (PULSE)	E (EARTH)

Columns "BITSWITCH/NCU PARAM" means:

e.g.:	Bitswitch Nr.	Default value	Actual value
	00	00000010	00000010

e.g.:	NCU Parameter Nr. Dec/Hex	Default value Dec/Hex	Actual value Dec/Hex
	0/00	42/2A	42/2A

SERVICE REPORT - FUNCTION 72

see section 10.1

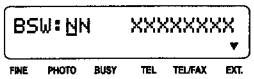
SET BITSWITCH - FUNCTION 73

Use this function to change a bit in the config bitswitch area.
The bit switches are listed in section 8.

WARNING !

Do not change a bit switch that is described as "Not used", as this may cause the machine to malfunction or to operate in a manner that is not accepted by local regulations.

1. Enter the service function (see section 7.3)

   The LCD shows: 

   (cursor blinks under NN)

   NN BSW-adress, starts with 00 (HEX)
   XXXXXXXX Value field; each X stands for a single bit of setting (0=not set, 1=set)

2. Enter the required BSW adress via the numeric keypad or use the * or # keys to in/decrement the address.
3. Press Start to move from address field to value field.
4. To change a certain bit use the numeric keypad - just type its position number now

   bit-number: 7 6 5 4 3 2 1 0
   position x x x x x x x x
   ---
   eg.: BSW 07: 0 1 0 1 0 1 0 1 -> BSW 7/Bit 0,2,4,6 are set

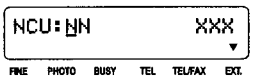
NOTE: If the bit was initially (before setting) "1", it's now "02" and vice versa.

5. Press START to switch back to address field.
6. Press OK to exit this function, followed by STOP.

NCU PARAMETER - FUNCTION 74

Use this function to adjust parameters for timing detection and dialling.
The NCU parameters are listed in section 7.4.2.

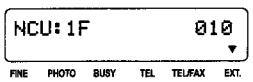
1. Enter the service function (see section 7.3)

   The LCD shows: 

   (cursor blinks under NN)

   NN NCU-adress, starts with 00 (HEX)
   XXX Decimal value setting of NCU parameter NN

2. Enter NCU parameter address in HEX via the numeric key pad.
3. For the letters from A to F use the * or # keys to in/decrement the address.
4. Press START to move from address field to value field and change the desired value (DEC) via the numeric keypad

   e.g.: 

   -> NCU 1F is set to value 10 (DEC)

5. Press LEFT or RIGHT to correct wrong Data entries.
6. Press START to switch back to address field.

NOTE: Changing the value is immediately accepted, no way return to previous if mistyped!

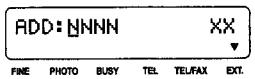
7. Press OK to exit this function, followed by STOP.

CHANGE MEMORY - FUNCTION 75

Use this function to check the ROM/RAM and change the RAM contents.
The RAM addresses are listed in section 7.3.2.

WARNING!

The user must be well aware of the meaning of these locations before making any change in RAM!
This may cause the machine to malfunction.

1. Enter the service function (see section 7.3)
2. The LCD shows: 

(cursor blinks under NNNN)

   NNNN Memory address (HEX)
   XX Memory data (HEX)
3. Use LEFT and RIGHT to control the cursor.
4. Press START to switch over from the address to the data field.
5. With the keys 0 - 9 on the numeric keypad and the R-key with the numeric keys 0 - 5 simultaneous for A - F the address and data field can be changed (all input values are hexadecimal).
6. With the * and # keys on the numeric keypad the address can be increased or decreased.

NOTE: Changing the data is immediately accepted, no way return to previous if mistyped!

7. Press OK to finish this function.

PRINT MEMORY - FUNCTION 76

Use this function to printout a certain memory area.

1. Enter the service function (see section 7.3).
2. Enter the start address or accept the given range and press OK.
3. With the keys 0 - 9 on the numeric keypad and the R-key with the numeric keys 0 - 5 simultaneous for A - F the address field can be changed (all input values are hexadecimal).
4. With the * and # keys on the numeric keypad the address can be increased or decreased.
5. Enter the end address or accept the given range and press OK.
   A print out of the selected area will be made.

Example for a Memory-print out

```
000000 : EF A4 00 C0 3F F0 7F DA  C0 00 01 A2 54 A5 80 C0   %ñ.L?&ÄUL..=TñCL
000010 : FE 04 05 55 A5 05 73 C0  FE 04 06 59 A5 02 00 C0   4[..Uñö.-L¢Y..L.
000020 : FE 08 40 EA FF FF FF E9  12 00 00 00 C0 00 7C A5   CCG...#..üü4@..L
000030 : 08 57 A6 00 02 6E F8 04  54 8E 04 00 03 8F C8 04   DB..AB-..§#LL..4
000040 : 44 CC 03 04 00 0A C0 00  00 0A 02 FF FF FF C2 8F   ?&ÄUL..=T..3DF.-
000050 : C8 04 1C 88 04 00 1A FF  FF FF E2 7C A5 F8 12 00   6§ÄUU.-B=]..NCL.
000060 : 7C A5 14 5F C8 00 5F C8  08 57 A6 00 02 6E F8 04   .H..§B99GH.F..Qö
000070 : C0 00 01 A2 54 A5 80 C0  FE 04 05 55 A5 05 73 C0   §..[*..K5.6.?L..
000080 : 00 0A 02 FF FF FF C2 8F  FE 08 40 EA FF FF FF E9   44.-LGH.R##...¢Y
000090 : 08 57 A6 00 02 6E F8 04  44 CC 03 04 00 0A C0 00   AB-..§ñö.-L¢G...
0000A0 : C0 00 01 A2 54 A5 80 C0  FE 04 05 55 A5 05 73 C0   .ñö.-L¢Y..L.U.-B
0000B0 : FE 04 05 55 A5 05 73 C0  7C A5 14 5F C8 00 5F C8   &ÄUL..=TñB=].4.-
0000C0 : FF FF E2 7C A5 F8 12 00  EF A4 00 C0 3F F0 7F DA   G...#..üü4@-L¢Y.
0000D0 : 00 0A 02 FF FF FF C2 8F  C0 00 01 A2 54 A5 80 C0   ÄUL..=T..3DCG...
0000E0 : 05 55 A5 05 73 C0 00 00  FE 08 40 EA FF FF FF E9   &ÄU-..§ñö.-L%ñ.L
0000F0 : C0 FE 08 40 7C A5 FC 12  7C A5 14 5F C8 00 5F C8   .H..§B99GH.F..Qö
```

DISPLAY FLAGS - FUNCTION 77:

NOTE: Do not use this function. It's only for factory use!
If used, the machine might do a SRAM-clear!

DISPLAY RINGS - FUNCTION 78:

NOTE: Do not use this function. It's only for factory use!
If used, the machine might do a SRAM-clear!

DISPLAY TESTS - FUNCTION 79:

NOTE: Do not use this function. It's only for factory use!
If used, the machine might do a SRAM-clear!

7.3.3 General tests

RAM TEST - FUNCTION 81

Use this function to do a RAM TEST, after the test the result will be returned.

1. Enter the service function (see section 7.3)
   The RAM is tested by writing 55h to RAM, shift left 1 bit and check with AAh if it is correct or not.
   The test does not destroy the contents of the RAM.
   If an error occurs the message "RAM ERROR AT XXXXXX" is displayed for 3 seconds and the message "RAM TEST ERROR" is printed.
   If no error is found, the message "RAM TEST OK" is printed.

KEY TEST - FUNCTION 82

Use this function to do a KEY TEST, after the test the result will be returned.

1. Enter the service function (see section 7.3).
2. The user is requested to press the keys of the control panel in a certain sequence.
   The LCD indicates the key to be depressed.
   The test is finished when the last key (the "START" key) is pressed. If all keys have been pressed correctly, the message "KEY TEST OK" is printed, otherwise the message "KEY TEST ERROR" is printed.

LED TEST - FUNCTION 83

Use this function to do a LED TEST, after the test the result will be returned.

1. Enter the service function (see section 7.3).
   All the icons of the LCD and the LED on the control panel are flashing in turns.
2. Check if the LED and all icons are OK.
3. If all LED's are working correctly press "START", the message "LED TEST OK" is printed.
4. If one of the LED's is defective press "STOP", the message "LED TEST ERROR" is printed.

LCD TEST - FUNCTION 84

Use this function to do a LCD TEST, after the test the result will be returned.

1. Enter the service function (see section 7.3).
   The LCD should display a black pattern alternating.
2. Check if all the dots of the LCD are switched on and off.
3. Press "START", if all dots are correct the message "LCD TEST OK" is printed.
4. Press "STOP" if one of the dots is defective, the message "LCD TEST ERROR" is printed.

SPEAKER TEST - FUNCTION 85

Use this function to do a SPEAKER TEST, after the test the result will be returned.

1. Enter the service function (see section 7.3).
   Now the speaker sounds.
2. Press "STOP" if the result is bad, the message "SPEAKER TEST ERROR" is printed.
3. Press "START" if the result is correct, the message "SPEAKER TEST OK" is printed.

PRINTER TEST - FUNCTION 86

Use this function to print a test pattern for checking the result.

1. Enter the service function (see section 7.3).
   Diagonal, vertical and horizontal lines will be printed.

7.3.4 Tel-unit

LIU PARAMETER - FUNCTION 91

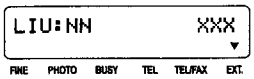
The following specifies the functionality of the LIU-parameters.

1. Enter the service mode (see section 3.1).

   The LCD shows:

2. Press LEFT or RIGHT and OK to print the settings.
3. Press OK to edit the settings.

   The LCD shows:

   (cursor blinks under NN)

   NN LIU address (HEX)
   XXX LIU data (DEC)

4. Select the start address with '*' and '#' or the numeric keypad and press 'START'.
5. Edit the data with the numeric keypad.
6. Press LEFT or RIGHT to control the cursor.
7. Press START to select the next address.
8. Press STOP to save and leave function 91.

Example for a LIU-Parameter print out:

```
                                   LIU PARAM
LIU PARAM.   DEFAULT    ACTUAL
     0/00     3/03      3/03
     1/01     0/00      0/00
     2/02    85/55     85/55
     3/03    10/0A     10/0A
     4/04    20/14     20/14
     5/05    15/0F     15/0F
     6/06   236/EC    236/EC
     7/07    85/55     85/55
     8/08    85/55     85/55
     9/09    20/14     20/14
    10/0A    60/3C     60/3C
    11/0B     0/00      0/00
    12/0C     0/00      0/00
```

e.g.: LIU Parameter Nr. Dec/Hex 0/00 — Default value Dec/Hex 3/03 — Actual value Dec/Hex 3/03

Addr.(HEX)	Function
00	Dial Mode Register
01	Pulse Mode
02	Inter digit time (delay)
03	Flash time
04	Access pause time
05	DTMF level high
06	DTMF level difference
07	DTMF on/off
08	DTMF off
09	Min ring frequency
0A	Max ring frequency
0B	PABX output level
0C	Country Codes

LIU - address HEX 00

Address HEX 00 defines the DIAL MODE REGISTER

Bit Nr.:	7 6 5 4 3 2 1 0
e.g. BIN:	0 0 0 0 0 0 1 1 = Data 03 (DEC)

Bit Nr.	Function	Set	Description
0	dial mode:	0	PULSE
		1	DTMF
1+2	not used		
3	extended dialing	0	normal dialing: 0-9,*,#,RECALL, rest not used
		1	extended dialing: 0-9,*,#,A,B,C,D
4+5	not used		
6	DTMF-mode	0	tone timed
		1	tone as long as key pressed (the tone on time is as long as the specific key is pressed but it has a minimum time which is the same like DTMF-mode is 0.)
7	MSG-mode		If pulse dial is selected and '*' or '#' will be pressed then dialmode will be switched to DTMF.
		0	Inactive: '*' or '#' will not dialed out - a pause will be made. It's not possible to switch back to pulse dialing.
		1	Active: '*', '#' or 'R' will be dialed out after the last interdigit pause has been performed. By pressing the R-key it's possible to switch back to pulse dialing (after DTMF has been finished).

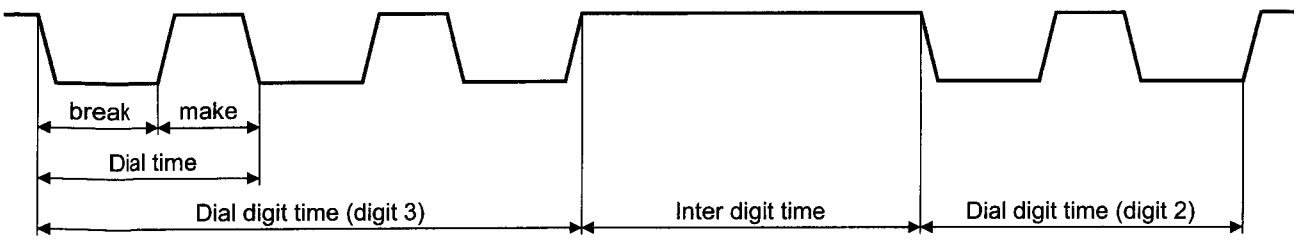
Switching from pulse dial mode to DTMF: Switching from pulse to DTMF dialing will be done by pressing the digit '*' or '#'. If bit 7 of the dialmode register is set the digit will be dialed out otherwise a pause is made and the dialmode will be switched (access pause time).

Switching from DTMF mode to pulse dial: Switching from DTMF to pulse is only possible if dialmode has first been switched from pulse to DTMF and bit 7 of the dialmode-register is set.
The controller switches back to pulse after flash has been processed.

LIU - address HEX 01

Address HEX 01 defines the PULSE MODE

General: Pulse Dial is performed by disconnecting and reconnecting the line in a defined way.
A number is represented by a number of digits. Each digit is represented by a number of disconnections according the number to dial. Any 'Break' (calling the disconnection) is followed by a 'Make' (a re-connection) until the complete digit is dialed.
Between two digits a pause is neccessary (inter-digit delay) before the next digit is ready to dial.



The timing relationship consists of two dial speeds calleds PPS (**P**ulse **P**er **S**econd):

10PPS and 20PPS (each part of a digit is dialed in 100ms or 50ms)
Additional an off/on+off ratio (break ratio) can be choosen

PPS	break ratio (%)	break (ms)	make (ms)	dial time (ms)
10	60	60	40	100
10	66	66	33	100
20	60	40	20	50
20	66	34	17	50

e.g.: Bit Nr.: 7 6 5 4 3 2 1 0

BIN 0 0 0 0 0 0 1 0 => Data 2
BIN 0 0 0 0 0 0 1 1 => Data 3

Bit Nr.	Function	Set	Description	
0	Dialing Speed	0	10 PPS	
		1	20 PPS	
1	Break/Make Ratio %		**10 PPS**	**20 PPS**
		0	60/40	40/20
		1	66/33	34/17

LIU - address HEX 02-0B

Addr. (HEX)	Function	Value	Divide value by	Description
02	Inter digit time (delay)	10...2550ms	10ms	see fig.1
03	Flash time	10...2550ms	10ms	
04	Access pause time	100...6500ms	100ms	
05	DTMF level high	-2...-15dbm	-1dbm	
06	DTMF level difference	-4...+4dbm	0,1dbm	*
07	DTMF on/off	3...255ms	1ms	
08	DTMF off	3...255ms	1ms	
09	Min detected ring frequency	10...100Hz	1Hz	
0A	Max detected ring frequency	10...100Hz	1Hz	
0B	PABX output level	-	-	not defined now

* For negative values calculate: 256 - (Value x 10)

LIU - address HEX 0C

Address HEX 0C defines the COUNTRY CODES.
BA-BE are the different types of country specific OTPROM's.

eg.: For PROM-BA it's possible to select Argentinia (04), Belgium (08), Brazil (03), Chile (09), Int (00), Mexico (0A), Netherland (07), Portugal (01), Southafrica (02) and Spain (06)

Country	BA	BB	BC	BD	BE
Argentinia	04				
Australia					04
Austria		03			
Belgium	08				
Brazil	03				
Chile	09				
China					03
Czech Republic				01	
Denmark			05		
Finland			0B		
France		02			
Germany		00			
Greece		0B			
Hungary				00	
India		08			
Indonesia					05
Int(ernational)	00				
Ireland		06			
Israel		07			
Italy		04			
Marocco					00
Mexico	0A				
Netherland	07				
Norway			0A		
Polen				02	
Portugal	01				
S-Africa	02				
Spain	06				
Sweden			09		
Switzerland		05			
Taiwan					01
Thailand					02
United Kingdom		01			

7.4 TABLE OF BSW AND NCU-PARAMETER

7.4.1 BSW listing

The bitswitches are the 1-bit sytem parameters that determine the machine's behaviour.
They can be modified with function 73.

LOOP CURRENT DETECTION

BSW	Bit	Settings	Description
00	3	1 = OFF 0 = ON	Loop current detection
03	7	1 = ON 0 = OFF	Invert loop current detection

RING DETECTION

BSW	Bit	Settings	Description
0B	6	1 = ON 0 = OFF	Direct fax reception on a normal ringing signal.
0B	7	1 = ON 0 = OFF	Direct fax reception on a duplex ringer signal (see also NCU parameter 0x41).

DIAL/TONE DETECTION

BSW	Bit	Settings	Description
00	0	1 = OFF 0 = ON	PSTN dialtone detection.
00	1	1 = OFF 0 = ON	PABX dial tone detection.
00	2	1 = OFF 0 = ON	Busy tone detection.
00	4	1 = ON 0 = OFF	Country dial tone detection (see NCU parameter 09 and 0A).
00	5	1 = ON 0 = OFF	International dial tone detection (see NCU parameter 07 and 08).
00	6	1 = ON 0 = OFF	Dial tone detection, detection of dialtone after the country code.
00	7	1 = ON 0 = OFF	Redial only when busy.
06	7	1 = ON 0 = OFF	150 Hz dialtone detection.
07	0	1 = OFF 0 = ON	BUSY detection before dial (to avoid misdetection of PABX-dial tone).
0D	5	1 = OFF 0 = ON	PSTN dialtone detection during PABX mode. Set this bit to support PABX systems with no PSTN dialtone.

USER INTERFACE

BSW	Bit	Settings	Description
01	7	1 = ON 0 = OFF	Fax error (LED+message) autoreset after next good fax transaction.
02	0	1 = OFF 0 = ON	Footer printed on received page: date/time, CSI, page number.
02	1	1 = OFF 0 = ON	CSI programming by user (function 12 for the user).
02	2	1 = OFF 0 = ON	PABX setting possible for user (function 14 for the user).
02	4	1 = OFF 0 = ON	Automatic print out of transmission report after sending (always on).
02	5	1 = OFF 0 = ON	TTI generation on transmitted page (page header) (Reflects function 17 setting)
02	6	1 = YES 0 = NO	TTI replaces graphic data (in/out positon of page header) (Reflects function 17 IN/OUT setting)
02	7	1 = OFF 0 = ON	Key press acknowledge tone generated (always on).
03	0-1		**Bit 0** **Bit 1** **Format date display** 0 x Day Month Year 1 1 Month Day Year 1 0 Year Month Day
03	2	1 = 12h 0 = 24h	Display format of clock.
04	3	1 = OFF 0 = ON	Disables selection of external phone for the user (function 32 for the user).
04	4	1 = digit 0 = charakter	Display format of month.
04	5	1 = OFF 0 = ON	User may change the language (function 15 for the user).
05	5	1 = OFF 0 = ON	RDS TIMEOUT - RDS access is switched off after 24 h.
07	4	1 = ON 0 = OFF	FAX AUTOSTART (always on).
07	5	1 = OFF 0 = ON	Disables selection of REMOTE DIAGNOSTIC (function 41 for the user).
0D	4	1 = ON 0 = OFF	Slow transmission (reflects function 21 setting).
0D	6	1 = PABX 0 = PSTN	Reflects function 14 settings.
12	0	1 = OFF 0 = ON	'pulse or tone' question in function 14.

SERVICE

BSW	Bit	Settings	Description
01	0	1 = ON 0 = OFF	Speaker operation during T30 handshake.
01	1	1 = ON 0 = OFF	Speaker operation during T30 handshake and V29 operation.
01	2	1 = ON 0 = OFF	DISPLAY of PARAMETERS instead of CSI Format: SSRC R(resolution): N(normal), F(fine) SS(speed): 96, 72, 48, 24 C(coding): H(huffman), R(read)
09	1	1 = ON 0 = OFF	Display SILENCE VALUES (threshold for NCU#32) during external phone mode. This bitswitch is only for debugging.

MISCELLANEOUS

BSW	Bit	Settings	Description
01	3+4		**Bit 3** **Bit 4** **Maximum document length** 0 X 0,6m 1 1 0,8m 1 0 8 minute transmission limit
01	5		Delay before CNG is sent (can be used in conjunction with BSW 09/4) **BSW 01/5** **BSW 09/4** **CNG delay** 0 0 3s 0 1 0s 1 1 1s
03	4	1 = ON 0 = OFF	D: special FTZ requirements (18TR53)
04	0-1		**Bit 0** **Bit 1** **Cable length** (adjust if problems with sending/receiving) 0 0 no 0 1 short (1,8 km) 1 0 medium (3,6 km) 1 1 long (7,2 km)
05	0	1 = ON 0 = OFF	Automatic FALL BACK to 9600 bps after a succeeding
05	6	1 = ON 0 = OFF	Automatic TRANSMISSION ERROR TIMEOUT of 30 s
05	7	1 = OFF 0 = ON	Selection of DTMF code in function 32
06	5	1 = 425Hz 0 = 700Hz	Frequency of ringback tone.
06	6	1 = 3sec 0 = 5sec	RINGBACK CADENCE
08	1	1 = OFF 0 = ON	R key muting in PSTN mode , execute Earth/time Break instead
08	2	1 = OFF 0 = ON	Sending of NSF (NOTE: RDS doesn't work if switched off!)
08	4	1 = ON 0 = OFF	After last unsuccessful redial disable start access to a stored number
09	0	1 = ON 0 = OFF	External TAM mode; take line immediately after external TAM drops line
09	4		Delay before CNG is sent (can be used in conjunction with BSW 01/5) **BSW 01/5** **BSW 09/4** **CNG delay** 0 0 3s 0 1 0s 1 1 1s
0C	0	1 = OFF 0 = ON	DTMF detection
0E	0	1 = ON 0 = OFF	Use parallel phones (if EXT.PHONE is selected).
0E	1	1 = Tx 0 = 9600bps	Receiving speed: 0=9600 bps 1=4800 bps if slow transmission is set (function 21)
0E	2	1 = ON 0 = OFF	If set and SLOW (4800) is selected, speed is 2400 bps and not 4800 bps.
0E	4	1 = ON 0 = OFF	Possible to enter 2 DTMF digits for remote fax start (0-9, *, # are allowed).
0E	7	1 = ON 0 = OFF	CNG detection in EXT.PHONE mode.
0F	1	1 = ON 0 = OFF	CNG and DTMF detection with parallel phones.

MISCELLANEOUS

BSW	Bit	Settings	Description
10	3	1 = ON 0 = OFF	RDS. It is neither useful nor required to clear or set this bit via RDS itself. It is only used to enable RDS by default. (Set in this case also BSW 5 / 5).
10	4/5	1 = ON 0 = OFF	**Bit 4:** Beep after successful transmission resp. reception. **Bit 5:** Error tone after unsuccessful transmissions resp. receptions. Upto this version it was default to emit this tones. Now it is possible to switch them off. Don't touch this bit if you are not sure about the approbation requirements for each specific country. **Note:** Clear this bit to make a real silent reception possible.
10	6	1 = ON 0 = OFF	Redial of '*' and '#' if set.j e.g.: User dials 1234*56789 via the keypad or via speed/name dial-key: **Bit 6** **unit dials** 0 '1234' 1 '1234*56789'
11	1		Adds one CNG to the minimum required CNG's for a specific mode. (The minimum required CNG's are specified by NCU parameter 4F). **Bit =1**: TEL/FAX 2, TAM 3 ... (you can switch between 2 and 3 CNG's) **Bit =0**: TEL/FAX 1, TAM 2 ... (you can switch between 1 and 2 CNG's)
11	3	1 = ON 0 = OFF	Ringer cadence following.
11	6	1 = ON 0 = OFF	Duration tone detection. A duration tone is a constant not defined (neither frequency or volume) tone.
12	2	1 = ON 0 = OFF	Special tone detection (busy tones) during CNG. Tones are detected only while sending CNG and a cadence has been detected at least two times prior starting CNG (within the 3s off phase of the CNG). This bit should be enabled if cadences are detected hardly with on/off times of >= 1s (detection times > 8s and longer or not detectable).
12	3		With a parallel phone the machine goes on the line to detect CNG, Access Code,... If this BSW is set it is possible to switch the unit to the idle mode from the parallel phone by entering '**'

Note 1: To get the default settings of Bitswitches and NCU parameters, use function 71 (print sytem report). The default values and the actual values are listed with a " * " indicating modifications.

Note 2: If user forgets his usage code, enter BE8E (B = R-key + 1, E = R-key + 4).

7.4.2 NCU parameter listing

The NCU parameters are the 1-byte system parameters that determine the machine's behaviour.
They can be modified with function 74.

All values are decimal.

LOOP CURRENT DETECTION

NCU (HEX)	Unit	Range (DEC)	Description
00	100ms	1-255	If loop current detection is requested and there is no loop current within this time, an error condition occurs.
01	10ms	10-255	The loop current is accepted if it is stable for this time (attention: extreme low values causing problems with ring detection)
02	10ms	1-255	Loop current drops within this time are ignored.

RING DETECTION

NCU (HEX)	Unit	Range (DEC)	Description
04	10ms	4-255	Ringing signal must be at least off for this time to detect END of ring. Set this value HIGHER than pause time of double rings.
05	10ms	4-255	Ringing signal must be at least on for this time to detect START of ring. Set this value LOWER than the 1st ring-pulse of double rings.
06	100ms	5-255	After this time ring count will be cleared. Set this time longer than the maximum pause between 2 rings.
23	1ms	8-15	Pause between two ringback tones.
26	100ms	0-255	Pause between going online and first ringback.
28/29	bitfield	0-255	Selectable number of rings (0..7) for TAM/FAX mode.Bitmask; each bit stands for a valid selection in the range from 0/8 to 7/15 rings. **bit-number:** 7 6 5 4 3 2 1 0 **number of rings (NCU#28)** 7 6 5 4 3 2 1 0 **number of rings (NCU#29)** 15 14 13 12 11 10 9 8 **decimal equivalence:** 128 64 32 16 8 4 2 1 Example: User should be able to select 5,7 and 9 rings only: NCU#28 = 160 to set (128+32) / NCU#29 = 2 to set
3C	bitfield	0-255	Contains all selectable rings in TEL/FAX mode in the form of a bitfield. Each bit represents a selcetable ring. **value (dec)** / **bitfield** / **selectable rings** 000 / 00000000 / no rings selectable 001 / 00000001 / 0 002 / 00000010 / 1 031 / 00011111 / 0,1,2,3,4 **Example:** If the user should be able to select 0,1,2,3 rings only set NCU#3C : 015. **Note:** - 000 disables the user to select this function. - The time between 2 rings is country dependent (3-5s). - Too high values may cause problems with silence fax machines.
41	10ms	0-255	Ringer on-time for the duplex ringer (0=disabled). See also BSW 0B/7 .

INPUT/OUTPUT LEVELS

NCU (HEX)	Unit	Range (DEC)	Description
17	dBm	35-51	Input sensitivity level.
1B	dBm	0-15	Modem Transmit signal output level. Switch the machine off and on after changing the parameter to reinitiallize the modem. (service function 63)
40	#	0-255	Modem correction factor. Reflects settings made in service function 65.

DIALING/TONE DETECTION

NCU (HEX)	Unit	Range (DEC)	Description
07/08	2 digits	0-225	The international call sequence can be up to 4 digits long and is packed in 2 bytes, each byte holds 2 digits. Digit "F" indicates the end of the sequence. **Example:** for the sequence "009" set NCU#07 = 00 (000 dec) and NCU#08 = 9F (159 dec)
09/0A	2 digits	0-225	The domestic call sequence can be up to 4 digits long and is packed in 2 bytes, each byte holds 2 digits. Digit "F" indicates the end of the sequence. **Example:** for the sequence "0" set NCU#09 = 0F (015 dec) and NCU#0A = FF (255 dec)
0C	1s	1-255	Max. wait time for dialtone. If no dialtone is detected within this time, dialling is aborted, NO DIALTONE Message is displayed (min 2 cycles in case of tone cadences).
0D	20 ms	0-254	PAUSE-Key time. The delay in dialling generated by the REDIAL/PAUSE key (255 ... wait for dialtone!).
0E	1s	1-255	Total delay time allowed for multible PAUSE-key entries (0 = unlimited).
0F/10	100ms	0-255	If PABX/PSTN dialtone detection is disabled (BSW 0 Bit 1/0), the machine waits this time instead of dialtone detection. **NOTE:** A delay of NCU parameter 01 plus 0.65s is added to this value!
11	#	0-255	Maximum number of dialling attempts to a fax number including the initial dial.
12	10s	0-255	Pause time between 2 automatic redial attempts (valid for FAX send and TAM forwarding mode, too).
34	#	0-3	CNG frequency width: 0: 1100 Hz ± 26 Hz 1: 1100 Hz ± 40 Hz 2: 1100 Hz ± 50 Hz 3: 1100 Hz ± 100 Hz
35	20ms	0-255	Minimum length of busy tone.
4D/4E	20ms	0-255	On time / Pause time of CNG signal.
56/57	bitfield	0-255	**NCU#56:** Defines tones which have to be detected if busy is requested during not beeing in the T30. **NCU#57:** Defines tones which have to be detected during T30 in addition to the busy. - 001 = dial tone - 002 = international dial tone - 004 = dial tone during ICM-record - 008 = continuous dial tone - 016 = special dial tone

USER INTERFACE

NCU (HEX)	Unit	Range (DEC)	Description
1C	#	0-3	Setting of current language for display and reports (Reflects function 15) . The actual value is an index to the n-th language within the ROM-set and not a unique number.
2E	bitfield	0	DTMF code for remote control of the faxswitch. Reflects settings of function 32 (EXT. PHONE) 8 bits for two DTMF characters. First character is reservd with "A" (HEX) (=DTMF code "*"). Example: DTMF code * 2 should be entered Bitfield: 101
3D	#	0-255	Number of rings in TEL/FAX mode.
3E	#	0-255	Number of rings in EXT TEL mode.
3F	1s	0-255	Silence detection time in EXT TEL mode.
49/4A	Bitfield	0-255	Selectale number of rings (0..15) for EXT-Phone. Bitmask; each bit stands for a valid selection in the range from 0/8 to 7/15 rings. **bit -number:** 7 6 5 4 3 2 1 0 **number of rings(Addr.49)** 7 6 5 4 3 2 1 0 **number of rings(Addr.4A)** 15 14 13 12 11 10 9 8 **decimal equivalence:** 128 64 32 16 8 4 2 1 Example: see NCU#28/29

MISCELLANEOUS

NCU (HEX)	Unit	Range (DEC)	Description
03	#	0-255	Minimum count of rings before the machine goes online in TEL/FAX mode (unit will not ring during this number of rings).
13	#	1-255	Training repeat count after FTT.
14	1s	0-255	This additional time is added to the standard of 35s wait time for a connect. During a fax call the machine waits the resulting time (35s + NCU#14) for a valid response (CED) before disconnecting.
15	%	0-255	Error limit value in percent (if BSW 1 / 6 = 0) Error limit value in lines (if BSW 1 / 6 = 1)
16	1ms	0-255	Delay between CFR and message phase.
2B	10ms		Delay between DCS and training.
37	0,1dBm		Adjust CNG detection threshold level.
38/39	#	0-255	During non-FTZ-CNG-detection, the sensitivity of the detection is influenced. Valid for Internal / External Device and 15MHz Clock-Speed Value 0... highest sensitivity, (about -49 dBm)
4F	Bitfield	0-255	Defines the required CNG bursts for each mode.
53	Bitfield	0-255	combined field containing SPEAKER VOLUME in HIGH NIBBLE and RINGER VOLUME in LOW NIBBLE of parameter SPEAKER VOLUME defines volume-level used when speaker is enabled, RINGER VOLUME defines volume-level used when buzzer is activated
54	Bitfield	0-100	VOLUME FACTOR defines percentage of volume_level for ringer used for BUZZER TONES like keytone and errortones.
5A	100ms	0-255	Specifies the length of the duration tone. (see also BSW 11 / 6)
5C	20ms	0-255	Minimum lenght to detect dialtone.
5D	200ms	0-255	Minimum lenght to detect busytone.

III Service

In this Chapter you can find

- illustrated removals of the mechanics
- trouble shooting with a table of all error codes for the error report
- technical specifications of the machine
- Block and wiring diagrams
- detailed PCB-descriptions

8 REMOVALS

Caution
Disconnect the machine from the mains before removing any cover!

8.1 TOP COVER

8.1.1 Remove top cover

1. Put the handset away
2. Open the front panel and the paperguide
3. Remove the distanceplate as shown in fig.1a (A)
4. Remove the screws as shown in fig.1
5. Push the snapper on the backside inwards as shown in fig.1 (B)
6. Lift up the top cover and pull it forward.
7. Disconnect the cable from the FCU

Screws: 2x torque size 8

Cable: 1x OPU-FCU

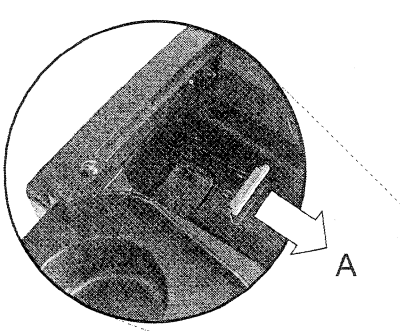


fig.1a

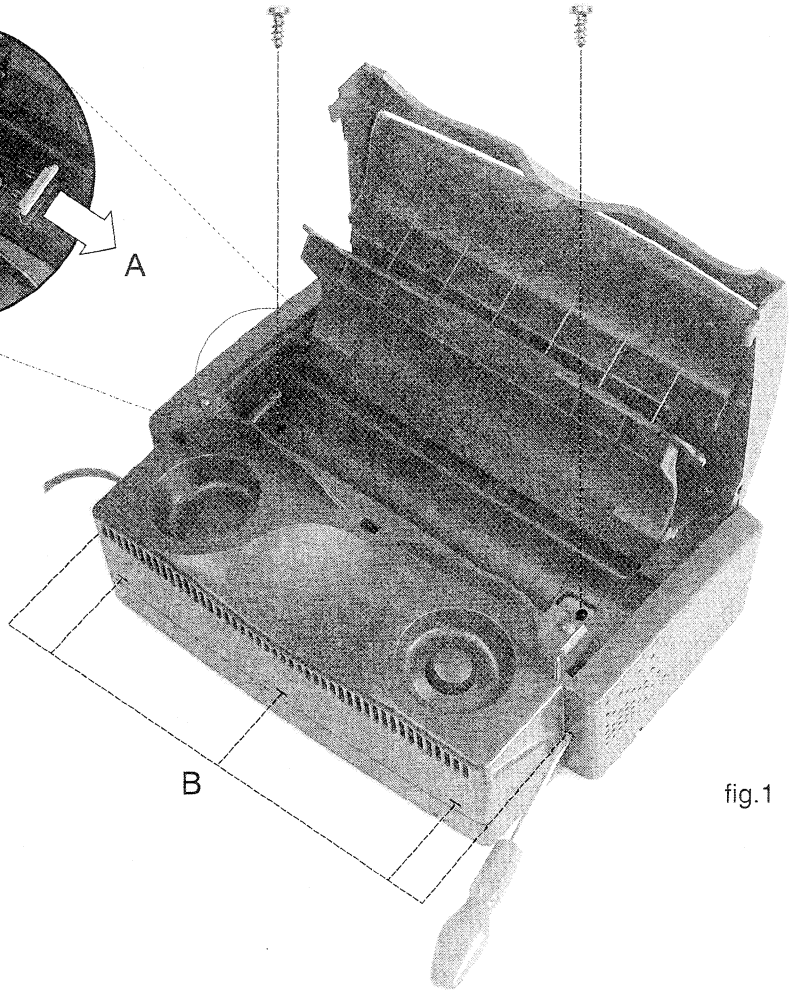


fig.1

8.2 PGU

8.2.1 Remove hookswitch

1. Remove the top cover (see section 8.1.1)
2. Remove the hookswitch
3. Remove the hookswitch lever spring (fig.2)

NOTE: For rebuilding lubricate both ends of the hookswitch spring with Molykote PG 30L.

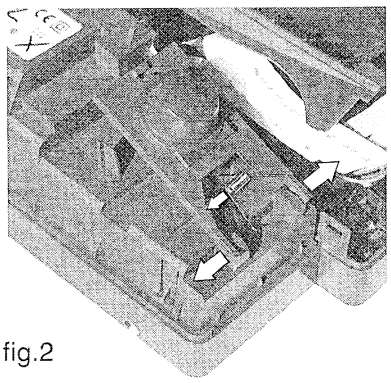


fig.2

8.2.2 Remove PGU

1. Remove the top cover (see section 8.1.1)
2. Disconnect the cable from the FCU
3. Bend out the snapper at the bottom of the machine (fig.3a), and push the PGU to the left side as shown in fig.3

Cable: 1x PGU-FCU

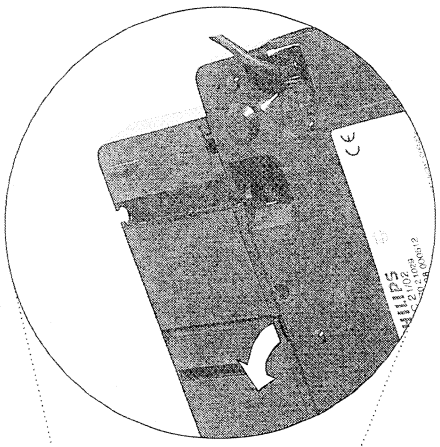


fig.3a

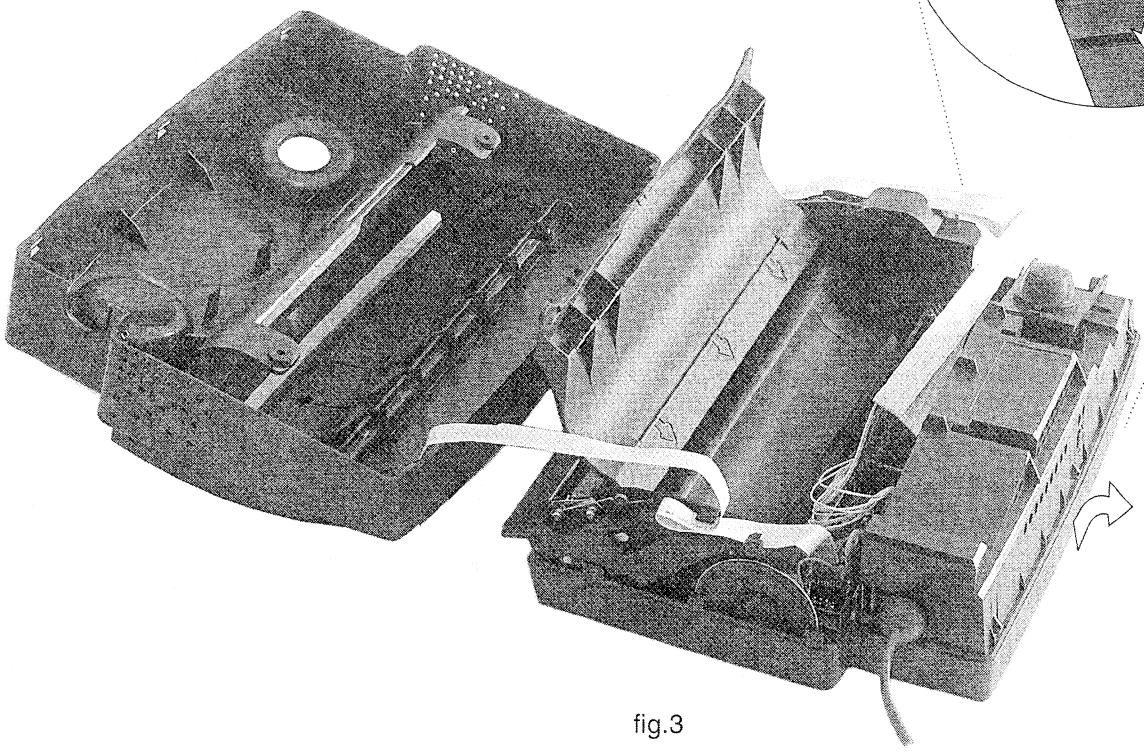


fig.3

8.3 OPU

8.3.1 Remove OPU

1. Remove the top cover (see section 8.1.1)
2. Tread out the cable from the top cover
3. Push the snapper inward
4. Remove the OPU

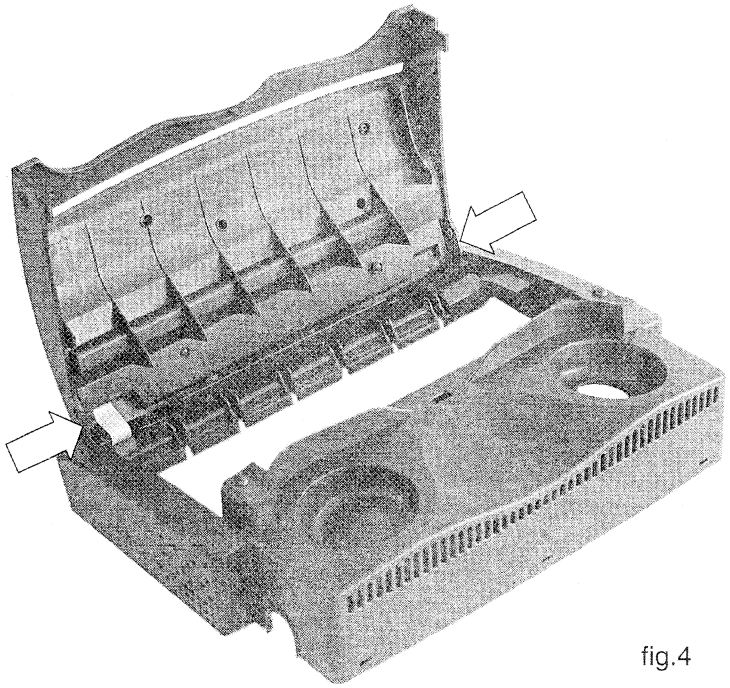


fig.4

8.3.2 Remove paperguide

1. Open the front panel and the paperguide
2. Press the paperguide to the left side and push it out along the groove

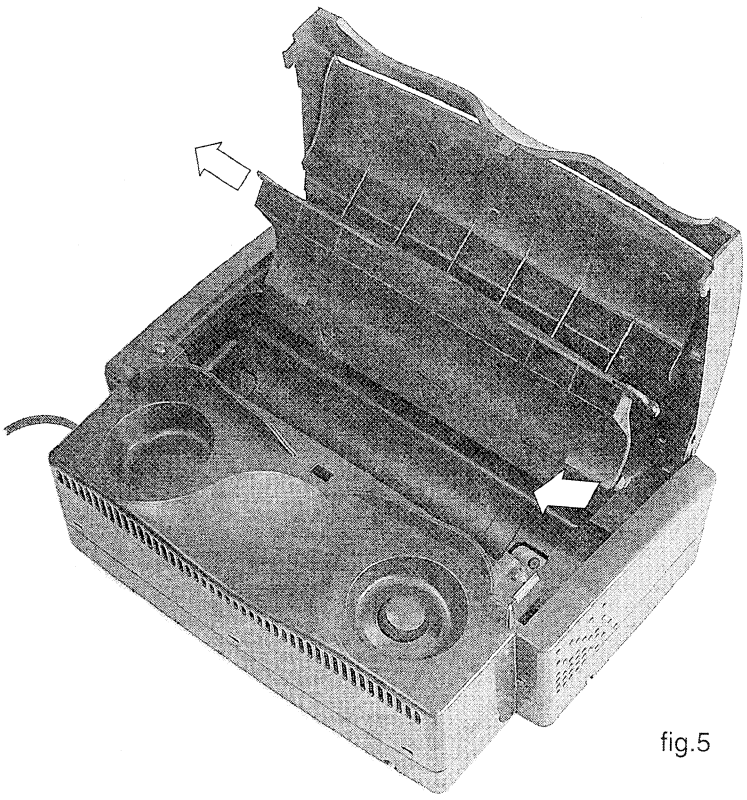


fig.5

8.4 MECHANICAL MODULE

8.4.1 Remove mechanical module

1. Remove the top cover (see section 8.1.1)
2. Remove the paperguide (see section 8.4.1)
3. Press the release lever downwards and
   lift the mechanical module out of the bottom
4. Disconnect the cables from the FCU

Cables: 2x TPH-FCU
1x CIS-FCU
1x SDI/SOP-FCU
1x RX/TX-FCU

NOTE: The connectors for the TPH-cables are similar. After rebuilding be sure, that the cables of the mechanical module are properly connected (see section 9.1)
white cable: P409
black cable: P406

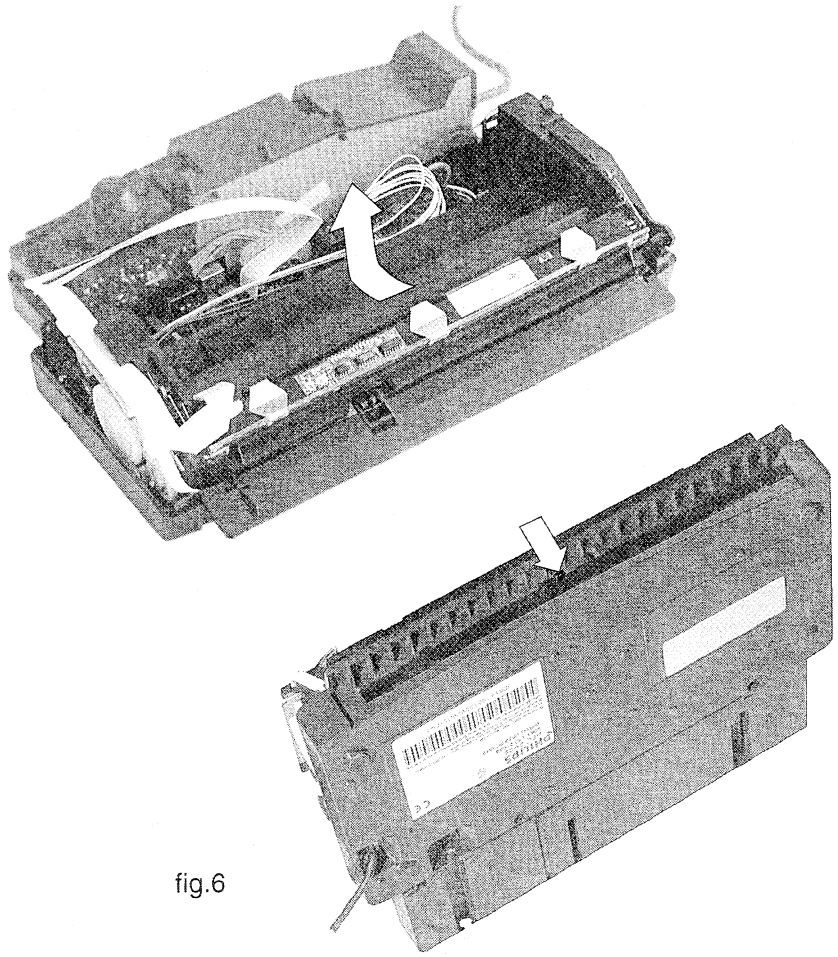


fig.6

8.5 PCB'S

8.5.1 Remove LIU

1. Remove the mechanical module (see section 8.4.1)
2. Remove the screws and move the LIU out of the bottom — Screws: 3x torque size 8
3. Disconnect the cables — Cables: 1x LIU-FCU, 1x Handset

8.5.2 Remove FCU

1. Remove the mechanical module (see section 8.4.1)
2. Disconnect the cables — Cables: 1x PGU-FCU, 1x LS-FCU
3. Remove the shielding plate from the FCU
4. Remove the screws and move the FCU out of the bottom — Screws: 12x torque size 8
5. Disconnect the cable — Cable: 1x LIU-FCU

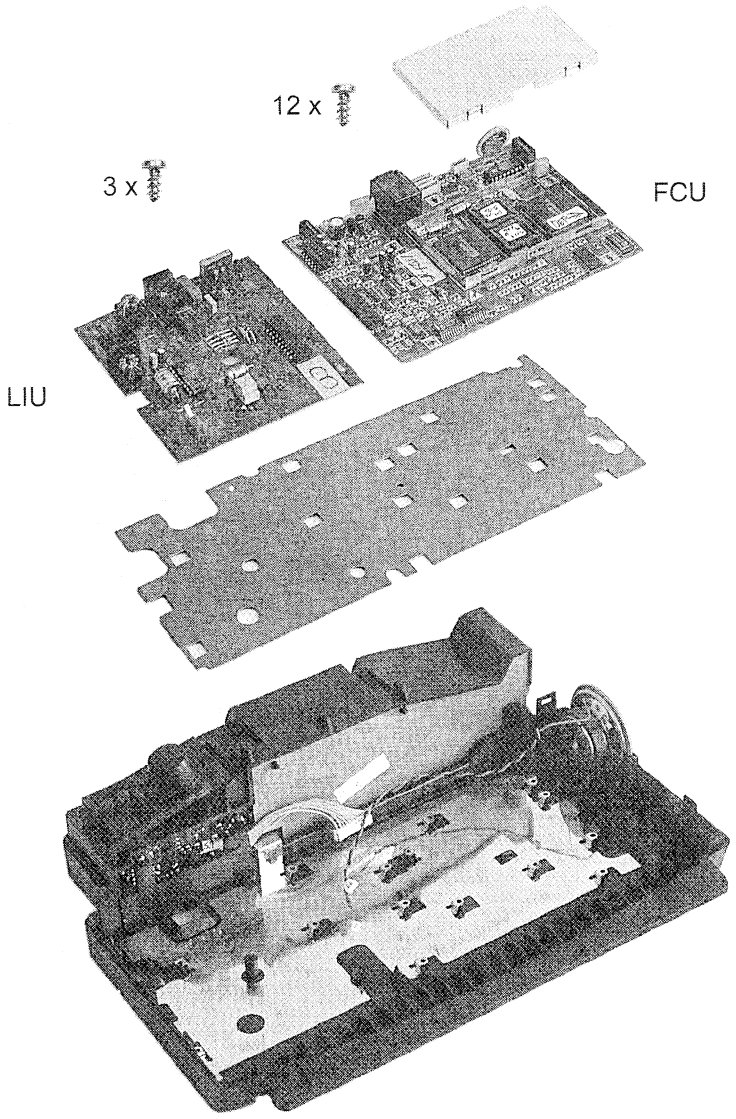
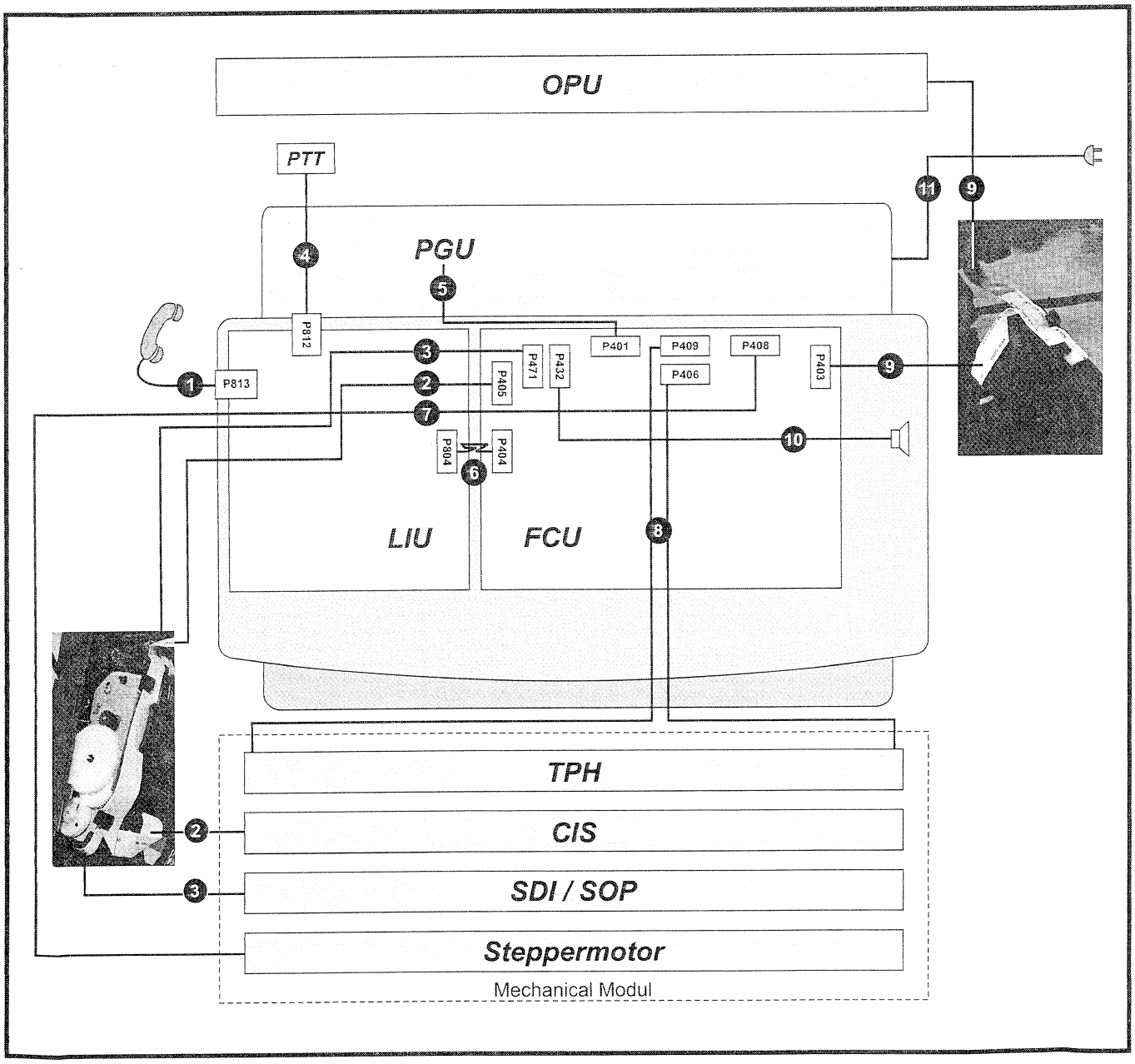


fig.7

9 PCB - ARCHITECTURE

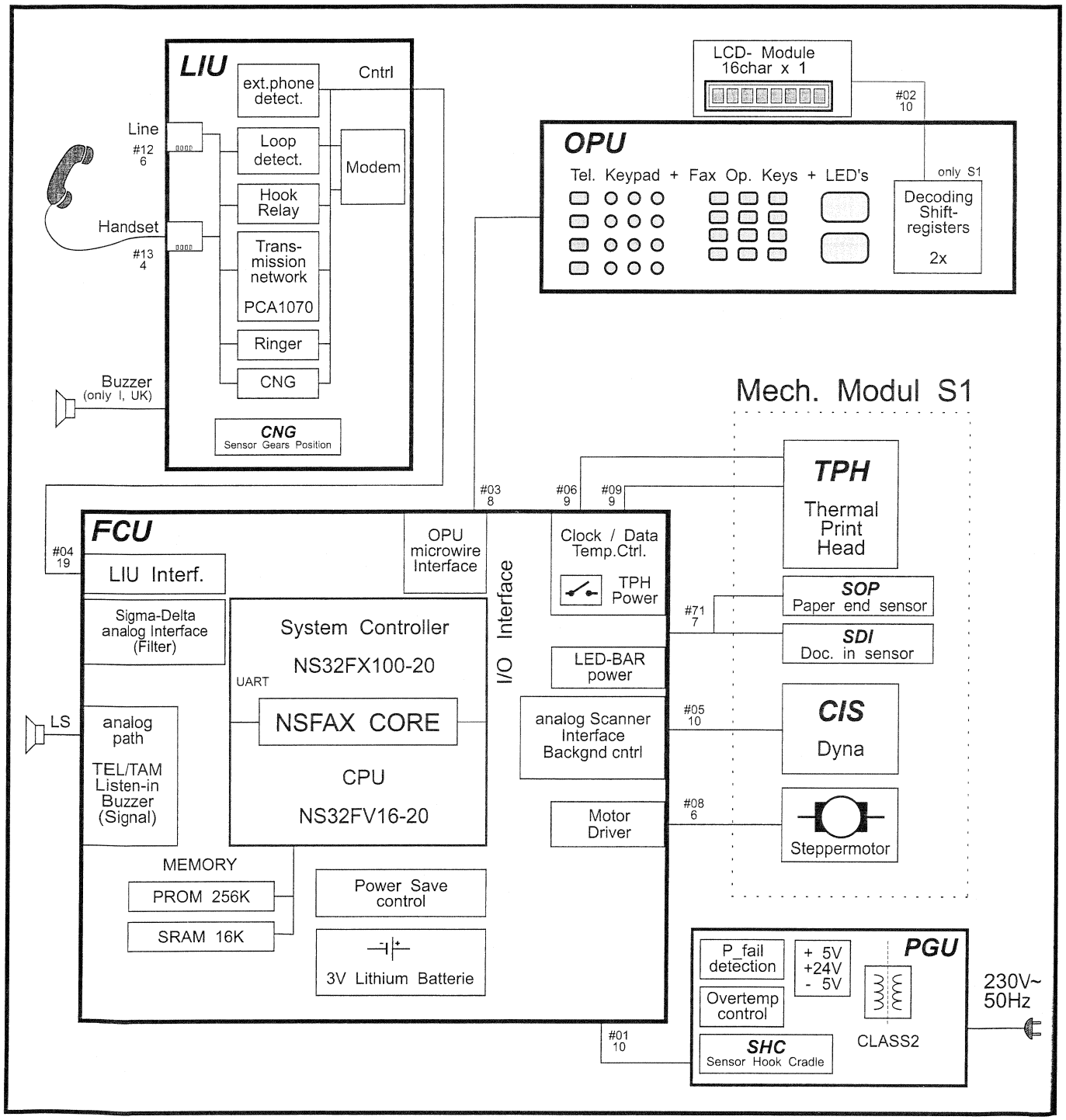
9.1 WIRING

Nr	From	To	Pol
1	LIU	Handset	4
2	CIS	FCU (P405)	10
3	SDI / SOP	FCU (P471)	3+3
4	PTT	LIU (P813)	4 or 6
5	PGU	FCU (P401)	10
6	LIU (P804)	FCU (P404)	19
7	Motor	FCU (P408)	5
8	TPH white	FCU (P409)	9
8	TPH black	FCU (P406)	9
9	OPU	FCU (P403)	8
10	LS	FCU (P432)	2
11	Power point	PGU	2



9.2 BLOCK DIAGRAM

PCB	Consist of	Connected to
FCU (***F***ax ***C***ontrol ***U***nit)		LIU, OPU, PGU, RX/TX-Motor, CIS, TPH, SOP, SDI, LS
LIU (***L***ine ***I***nterface ***U***nit)	SGP	FCU, Tel. Line, Handset
PGU (***P***ower ***G***eneration ***U***nit)	Hookswitch	FCU, Mains
OPU (***O***peration ***P***anel ***U***nit)		FCU



9.3 PCB DESCRIPTION

9.3.1 FCU - Fax control unit

FEATURE LIST

Fax core (CPU + ASIC)
Memory block: PROM (2 x 128K x 8)
SRAM (2 x 8K x 8)
Clock generation
Scanner interface
Thermo print head interface
Stepper motor driver
Interface to LIU and OPU
Cutter interface
Sigma Delta Interface (modem path)
Microphone-AGC, loudspeaker, buzzer elect.
Sensor interfaces
Digital volume control
Power save mode

CONNECTORS

P404	LIU, 19 pin
P403	OPU, 8 pin
P405	CIS, 10 pin
P401	PGU, 9 pin
P406	TPH, 9 pin
P409	TPH, 9 pin
P408	Steppermotor, 5pin
P432	Loudspeaker, 2pin
P471	SDI,SOP, 6pin

POWER SUPPLY

The FCU is powered by the PGU with -5V, +5V and 24V via connector P401

KERNEL

The kernel of the system is built around two NSC chips, a CPU including DSP for modem functions and the ASIC chip including I/Os, microwire and serial interface, AS-Flash, Interrupt and DMA controller, clock generation, address decoding, power down control and different types of interfaces to scanner, stepper motor, thermo print head, etc.

MEMORY

The memory block consists of two OTPROM or ROM and two SRAMs.
A 16 bit bus is used for memory accesses, ROM size is twice 128K x 8 and SRAM size is twice 8K x 8.
For SRAM-backup a Lithium-battery is used. (In NL a Goldcapacitor is build in instead of a battery).

CLOCK GENERATION

There is an oscillator (29,412 MHz) that is used to drive the system.
The internal 32-bit counter is used for clock functionality.

RESET CIRCUIT

The reset circuitry is a resistor and capacitor network.

SCANNER INTERFACE

The video signal is amplified and then sampled by a sample and a hold circuit and enters the ASIC.
The automatic background control is used by the ASIC to adjust the reference values for black and white or the grey levels in photo mode.

PRINTER INTERFACE

The data are serial shifted to the TPH. Four times in 10 msec the strobe signals are activated to turn on a quarter of the heater elements.

+24V POWER HIGH SIDE SWITCH

In the facsimile machine, a thermal printhead is used for printing. This device is supplied by 24 Volt and requires 4A max. During no operation-mode the voltage is switched off by a Relay.

LIU AND OPU INTERFACE

The LIU is connected to the FCU (P 404).
The OPU is conntrolled by the FCU. Via the microwire interface, shared with the AS-Flash and two additional IO´s the LCD, key- and LED-matrix will be controlled. The key scanning, LED control, panel identification and sensor handling is realized with shift registers on the OPU.

MODEM INTERFACE

The modem path uses a sigma delta interface and glue logic. The signal MTxD is generated from the ASIC which drives an analogue switch to generate a pulse width modulated signal. This signal is filtered in a Bessel-filter of third order to eliminate the switching frequency of 800 kHz. The result is the analog signal MTxD. The receive path does some amplification and filtering of the input signal. On the output you can see a PWM signal which is fed to the ASIC.

LOUDSPEAKER AMPLIFIER

The amplifier for the loudspeaker which is connected to P432 is used to connect under software control analogue signals from different sources (Ringsignal, Keytone,..) to the speaker amplifier.

STEPPER DRIVER

An open collector driver IC is placed on the FCU to drive the RX/TX-Motor.

SENSOR INTERFACE

SGP:
The start position of the gears is detected by a switch which is located on the LIU, via P404 the signal is connected to the FCU.
SHC:
This sensor detects the status of the hook and is located on the PGU, via P401 the signal is connected to the FCU.

DIGITAL RINGER VOLUME CONTROL

Four volume labels are possible. The keyclicks can be turned on/off.

POWER SAVE MODE

In Power save mode the system clock is divided by 16. Only the OPU, parts of the LIU
(Loop detect., external phone) and the Document In Sensor are monitored.
In this state the system needs only 2W Power.
If a document is placed in, a telephon call arrives, a key is pressed or the handset is liftet the CPU changes the status to normal mode.

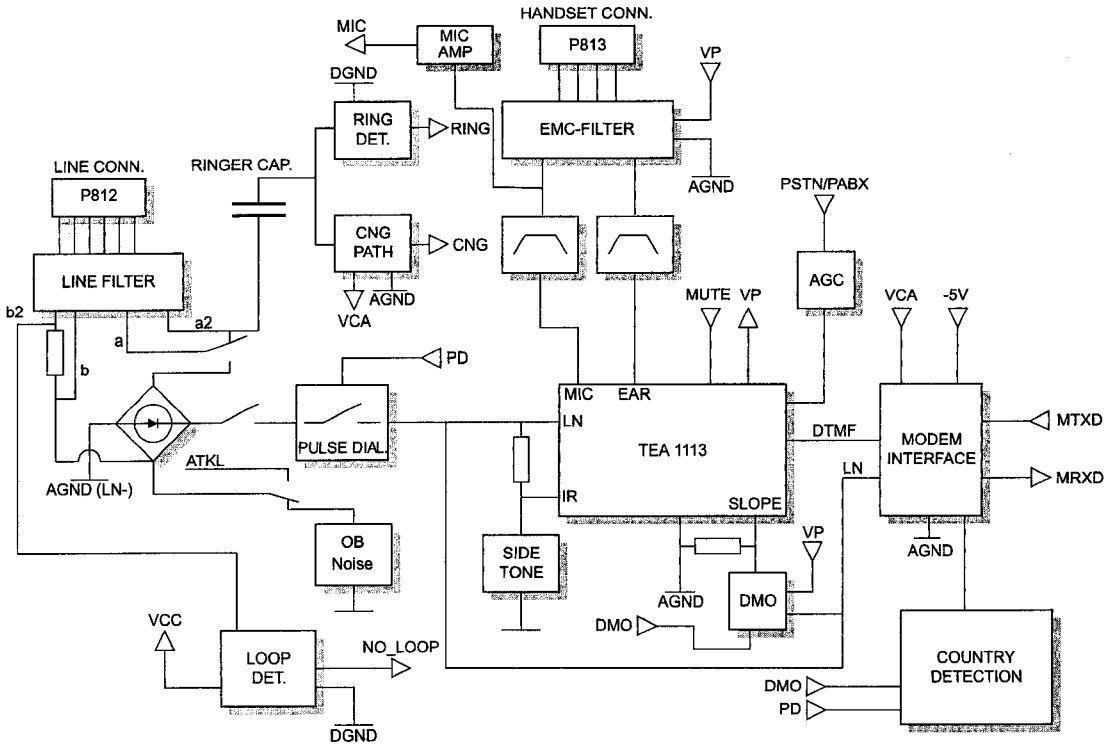
9.3.2 LIU - Line interface unit

The LIU is the interface between the FCU and the telephone line.
The Line interface has to fulfill all PTT requirements for various countries. Some parts of this board are country specific and have to be mounted with different values.

FEATURE LIST

line protection and filtering
loop detection
hook switch relais
ring detection
modem interface
external phone detection
country detection
dialling (pulse, DTMF, flash)
corded phone
CNG-detection
POTS-mode (only Italy and UK)

BLOCK DIAGRAM



CONNECTORS

The LIU provides the following connectors:
P804 FCU Interface
P813 Handset Connector
P812 Line Connector

CIRCUIT DESCRIPTION

The connection of the PSTN to the unit is done via the connector P812.
In the ON HOOK state the signal is fed from LA/LB via the EMI filter, contacts the hook relay and via the ringer cap. to the RING DET.
From the hook relay the signal is also fed back to P812 LA2/LB2 (for ext. phone).
In the OFF HOOK state the signal is fed via the EMI filter, the relay, the tax pulse filter (if available), the diode bridge and the pulse dial unit to the Phone Chip (TEA1113) and the modem.

PHONE CHIP (TEA1113)

The phone chip is the Philips Multi-standard Analog Bipolar Speech Transmission Network and is responsible for:

- 2 to 4 - wire interface for the handset.
- Acoustic adjustments like frequency response and level for the transmission and receive part.
- Sidetone compensation adjustment.
- DC characteristic of the phone and the fax and the answering device (if available).
- AC characteristic of the phone, fax and answering device (if available).
- Feeding the DTMF signals which are generated from the FCU board to the line.
- Supply for electret microphone.
- Dynamic limitation in transmit direction.
- Line loss compensation (AGC).

The fax transmit signals are coupled to the line via the DTMF input of the telephone chip, the fax receive signal is directly coupled from the line to the phonechip input LN+ and via wire direct to the modem. Both receive and transmit pass through the modem hybrid circuit that provides frequency response and gain adaptation and is also responsible for the echo cancelling in transmit mode.

RINGER SIGNAL DETECTION

In the On-Hook condition the ringing signal is fed from the connector P812 via the relay, the ring capacitor and the ring detection circuit to the FCU. The processor at the FCU board counts the frequency of the ringing signal and generates a ringing melody via loudspeaker if it is an allowed ringer frequency (country dependend).

CNG PATH

In on hook state CNG signal passes via decoupling (ring) capacitor and CNG PATH(detection) to the FCU.
This means monitoring the line without terminating it with a low impedance.

EXTERNAL PHONE DETECTION

External phone detection is done by a comparator that measures the line voltage. If external phone is connected the line voltage decreases and the logic signal become HIGH. On the contrary it's LOW.

LOOP CURRENT DETECTION

Absence of the loop current is detected by a comparator.
If the line voltage is too low the logic signal becomes LOW. On the contrary it's HIGH.

PARALLEL PHONE DETECTION

For parallel telephone detection the line voltage is measured by a comparator, if phone is on line and the interrupter is off. In case of a parallel phone a logic signal is HIGH. On the contrary it's LOW.

COUNTRY DETECTION

Two current sources on the LIU generate country dependent voltages. 6 different voltage levels from -2 to +2 volts are possible for each source. Both voltages are added and can be switched on or off by digital signals.
The resulting DC-signal is measured by the modem ADC. The country code is read out from the LIU.
The software is set to country depending setting.

9.3.3 OPU - Operation panel unit

The OPU (Operational Panel Unit) is the human interface to the facsimile machine.
The status is displayed by a LCD and a number of LED's.
A keyboard is provided for operator entry.
There are OPU type keys (such as functions, quick dial etc.) and the standard telephone dialpad (0...9, *, #).
All functions are performed by the core on the main board.
The keyboard status is scanned after an interrupt from the keypad.

KEYBOARD

The keyboard matrix consists of six columns and six rows.
The software debounces the keys and if two keys are pressed ignores this case and treats it as no key pressed.

LCD DISPLAY

A 16 character LCD whith a line of 6 activ icons is used and connected to P602.
The LCD is configured to 4 bit data transfer.

CONNECTORS

The OPU is connected to the FCU by means of a eight pin connector P667 providing power and the scanning matrix / serial interface.

9.3.4 PGU - Power generation unit

The PGU is a switched mode power supply, working as a flyback converter with a secondary buck converter.
The PGU components are mounted on two single-layer PCB of V0 material: The main pcb with the on/off line switcher, the powerfail circuit and the sub pcb with the secondary DC/DC converter.
For the use of a cheaper and less polluting plastic material of the whole fax machine, the PGU has to be built in a seperate fire protective part of the housing (see EN60950/4.4.6).

FEATURE LIST:

+24V (printhead, stepper motor, scanner illumination)
+5V (digital circuits, sensors, modem, analog circuits, scanner)
- 5V (analogue circuits, scanner)
Power fail signal (if 24V drops)
Cradle signal (on/off hook)

CIRCUIT DESCRIPTION

The input voltage is 195...264VAC; the output voltages are +24.3VDC/0...3A (4A peak), +5VDC/340mA and -5VDC/33mA in the normal operating mode. In the power save mode the 24.3V is loaded with 6mA, the -5V is loaded with 23mA and the +5V is loaded with 70mA.
The SMPS is short-circuit and open-circuit proof and it has an additional thermal protection.
Because the secondary outputs are on TNV potential, the PGU has to withstand 3kVAC and has to be double insulated.

PROTECTION CIRCUITS

Overcurrent Protection

The controller monitors the primary current by measuring the voltage. If the current is more than the limit (approx. 3A transformer primary current), a transistor is switched off immediately.

Overvoltage Protection

If the regulation loop fails or the secondary circuit has any interruption the output voltage and the primary auxiliary voltage begin to rise. To avoid major damage of SMPS and load, a zener diode starts conducting if the auxiliary voltage rises above 18V. This switches on a transistor which pulls down the compensation input of switching controller. This way the ON time of the switching transistor is reduced, so that the auxiliary voltage and the transformer-coupled output voltages cannot rise any longer.

Overtemperature Protection

If the heatsink temperature rises above 70°C, a NTC resistor gets lower in resistance. A transistor is switched on and pulls down the compensation input of switching controller. This way the ON time of the switching transistor is reduced, so the transferred power is limited and the temperature cannot rise any longer.

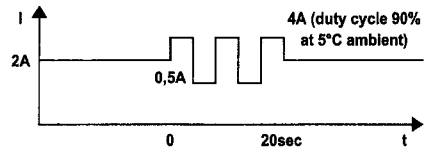
Power-save Mode
To ensure a power consumption of the FAX machine of less than 2W in the standby-mode, the SMPS has to change from the continuous operating mode to a so called 'burst-mode'.
In this mode current is transferred only for a few cycles, then there is a longer pause to reduce the switching losses. That is possible because only the +5V is loaded by a reduced current in the standby-mode.
But this 'burst-mode' causes a relatively high ripple voltage on the secondary outputs.
To keep the +5V output within tolerance, a secondary buck-converter is used.

Undervoltage detection
This circuit monitors the +24V supply voltage and generates an active low open collector power-fail signal, if the supply goes down. This PFAIL signal is connected to the FCU and forces the CPU to go to the power-save mode.
"Power-fail" is detected, if the +24V output drops to 11V.
The PFAIL signal goes low about 2 ms (at typical load) before VCC falls out of tolerance.

AC INPUT CONDITIONS

Phase:		single
Input voltage:	rated: range:	230 VAC 195 ... 264 VAC
Frequency:	rated: range:	50 Hz 47 ... 53 Hz
Power save mode:		max. 2W at 230VAC
Dip protection: **Reversion**		10ms at 230VAC IEC 1000-4-11 +24V/1,5A +5V/350mA -5V/33mA

DC OUTPUT CHARACTERISTICS (OPERATION MODE)

Voltage	Ripple voltage	Current
+24,3VDC + 0,4V -0,5V 0-800mA	2Vpp (20Mhz bandwith) 0,6Vpp at changing load (0.3-4A, 100Hz, duty cycle 10%)	
+5VDC±5%	50mV (200Hz-10kHz)	Typ. 350mA max 500mA
-5VDC±5%	50mV (200Hz-10kHz)	Typ. 23mA max 50mA

DC OUTPUT CHARACTERISTICS (POWER-SAVE MODE)

Voltage	Ripple voltage	Current
+24.3VDC±0.5V	6Vpp	Typ. 6mA max 15mA
+5VDC±10%	50mV (200Hz-100kHz)	Typ. 70mA max 140mA
-5VDC+10% -20%	50mV (200Hz-100kHz)	Typ. 21mA max 40mA

OUTPUT PROTECTIONS

Overcurrent:	max. 10ADC (+24V) max. 1ADC (+5V) max. 250mA (-5V)
Reversion	automatically
Overvoltage	max. 35V (+24V)
Reversion	restart

POWER FAIL SIGNAL GENERATION: MONITORS THE 24V OUTPUT

Output:	active low, open collector, 10mA driving capability (5V)
Threshold:	11VDC±0.5V
Hysteresis:	0.5V
Condition:	+5V within tolerance for 2msec min. after PFAIL goes active

EMI

Conducted:	regulation -6dB (all loads)
Radiation:	regulation -6dB (according to EN 55022/1988) an additional filter on the mains inlet is required to prevent from radiation of FCU-generated RF-noise

Safety requirements: EN 60950 class II equipment including NORDIC exceptions

High-pot test input to output:	3kVAC for 1sec (<10mA)
Insulation resistance:	>10Mohm 500VDC
Housing:	in accordance to EN 60950/4.4.6
Output:	in accordance to EN 60950/2.11 (limited power source)

Reliability: MTBF at standby: 1 000 000 hrs (power save mode <2W)

CONNECTORS AND CABLES

Input:	direct soldered mains cable with EURO-plug and strain relief at the right side of the PGU-housing.
Output:	cable with 10-pin AMP-CT connector

10 TROUBLE SHOOTING

10.1 SERVICE REPORT

The service report (function 72) is a listing of the most recent (10) error codes and gives information of the (5) most recent communications that experienced errors.
The Error code column indicates communication errors (see section 10.2).

1. Enter the service function (see section 7.3).
2. Press ENTER - The Service report list will be printed now.

SERVICE REPORT

TIME	ERR.CODE	REMOTE MACHINE	TX/RX	PAGES	SP	RESOL.	CODING
	04		R	0			
	04		R	0			
	42						
	04		R	0			
	40	4316010112345	R	1	96	STANDARD	MR
	31	4316010112345	R	2	96	STANDARD	MR
	40						
	06	4875	T	1	96	STANDARD	MR
	04		R	0			
	06	4316010154321	T	1	96	STANDARD	MR
	42						
	06	4316010112345	R	2	96	FINE	MR
	06	4172	T	0			

Position	Description
TIME	Date and time
ERR.CODE	see section 10.2
REMOTE MACHINE	CSI or if CSI not available the called telephone number
TX/RX	T = transmit, R = receive
PAGES	Number of pages transferred if any pixel transmission occured
SP	Transmission speed (9600, 7200, 4800 or 2400 bps)
RESOL.	Resolution (standard/fine/photo)
CODING	MR or MH

10.2 ERROR CODES

Nr.	Error message	Description	Action
01	PICT. QUALITY	The transmitted or received picture quality was unacceptable.	Check the line connection. The other machine may be defect or incompatible. Try sending to another machine. Ask the other party to adjust the output level. Switch on echo cancelling. (BSW 04)
02	TIMEOUT	The remote machine gave no answer within the specified time.	Check the line connection. The other machine may be defect or incompatible, try sending to another machine. Try to adjust the output level.
03	DCN RECEIVED	The remote machine terminated the communication, possibly transmission rejected.	The other party is out of paper or has a printer jam. The other party has pressed STOP during communication.
04	LINE DISCONNECT	An expected command has not been received, possibly the line was disconnected.	Check the line connection. The other machine may be defect or incompatible, try sending to another machine. Try to adjust the output level.
05	NO RESPONSE ON ALL RETRIES	The receiver did not reply the third training signal or the pixel message.	Check the line connection. The other machine may be defect or incompatible, try sending to another machine. Try to adjust the output level. Check for line problems. Exchange FCU - LIU.
06	ABORTED	The transmission was aborted due to STOP key or irregular circumstances.	For information only.
08	IDENTIFICATIONS RECEIVED WHILE WAITING FOR CFR	The remote receiver did not understand our answer to its identification.	Check the line connection. The other machine may be defect or incompatible, try sending to another machine. Try to adjust the output level. Check for line problems. Exchange FCU - LIU.
09	FALLBACK IMPOSSIBLE	It was not possible to send or receive an acceptable training signal.	Check the line connection. The other machine may be defect or incompatible, try sending to another machine. Try to adjust the output level. Check for line problems. Exchange FCU - LIU.
10	ABSOLUTELY NO LOCAL RESPONSE FOR REMOTE INTERRUPT	The remote machine issued a voice request, but the local operator did not respond.	Clarify with other party. Try different settings of remote machine. Try to adjust the output level and/or the input sensitivity.
11	LINE BUSY	Busy tone detected during fax communication.	Check the line connection.
12	INVALID DCS	The parameter set of the remote transmitter does not correspond to our capabilities.	Clarify with other party. Try different settings of remote machine. Try to adjust the output level and/or the input sensitivity.
13	IRRELEVANT RESPONSE	The called machine responded with a wrong frame (T30 violated).	The other machine may be defect or incompatible, try sending to another machine. Try different settings of remote machine.
15	INCOMPATIBLE REMOTE TRANSMITTER	It's not possible to find a common parameter set with the remote transmitter.	The other machine may be defect or incompatible, try sending to another machine. Try different settings of remote machine.
22	INCOMPATIBLE REMOTE RECEIVER	It's not possible to find a common parameter set with the remote receiver.	The other machine may be defect or incompatible, try sending to another machine. Try different settings of remote machine.

Nr.	Error message	Description	Action
23	SPEED MISMATCH	The remote transmitter returned in DCS a higher scan speed than the default DIS setting.	The other machine may be defect or incompatible, try sending to another machine. Try different settings of remote machine.
24	LINE TIMEOUT IN PICTURE	A picture line has not been received completly within 5 sec.	Check the line connection. The other machine may be defect or incompatible. Try to communicate with another machine.
26	NO POST MSG OR LOCAL INTERRUPT AT STATE F	Voice request was not acknowledged	Check the line connection. The other machine may be defect or incompatible. Try to communicate with another machine. Try to adjust the output level. Check for line problems. Exchange FCU-LIU.
27	PHONE DISCONNECTED	Connection terminated during voice request.	Try to send to another machine.
32	COMMUNICATION PROBLEM	Communication-error which cannot be defined with any other error code e.g.: polling request refused because polling isn't set.	Check correct settings of both machines. The other machine may be defect or incompatible. Try receiving/sending from/to another machine.
34	REMOTE REJECTED	Unauthorized caller was rejected.	For information only.
40	PAPER OUT	No paper detected.	Check thermal paper, check/replace paper sensor, check connections to FCU, replace FCU.
41	DOCUMENT JAM	Document was longer then specified (see BSW01 bit 3/4).	Check/replace the document-in sensor, check scanner motor, check connections to FCU, replace FCU.
42	POWER OFF	The power was switched off.	For information only.
43	POWER ON	The power was switched on (as long as battery backup is available).	For information only.
44	TIME SET	System timer had been set by user.	For information only.
45	PRINT OVERHEAT	Print head overheat was detected.	Check FCU, replace FCU/mechanical module.

10.3 ERROR MESSAGES

Error message	Reason	Action
NO DIALTONE	Machine can not detect the dialtone.	Try ONHOOK dialling to determine which dialtone can not be detected. Check PABX/PSTN setting. Switch off dialtone detection (see BSW 00/6).
NO LOOP CURRENT	No loop current detected.	Check line cable. Check LIU connectors. Switch off loop current detection (see BSW 00/3). Check correct OTPROM settings. Replace LIU.
NO CONNECTION	Other party is either busy or does not reply.	Check with manual dialing.
REDIAL FAILED	No connection after 3 attempts.	Check with manual dialing. Try calling later.
TRANSMISSION ERROR	Too many errors during transmission.	Check the line connection. The other machine may be defect or incompatible, try sending to another machine. Adjust output level. Set BSW04 (cable length). Switch on echo cancelling (BSW04). Switch on error autoreset (BSW01).
OUT OF PAPER	End mark of thermal paper detected.	Replace paper. Clean sensor. Replace paper end sensor or FCU.
DOCUMENT JAM	Document is longer than 600/800cm or causes a document jam.	Set the max Document length (BSW1 Bit 3/4).

10.4 PROBLEM LIST

Description	Reason	Action
There is no fault in the receiving terminal or on the line but the copy quality and printer test pattern are bad.		Check all cables from the mechanical module. Exchange the mechanical module.
Printouts of received fax messages and printer test pattern are OK but printouts made in copymode are not.	**White or black copies:** Failed connection between FCU and CIS **Vertical black lines on the copy, uneven density, blurred or filled-in characters** Dirty CIS or roller **One side darker than the other**	Check connection between FCU and CIS. Replace CIS/FCU. Clean or exchange the CIS if there are any sharp peaks or dropouts in the CIS waveform (Function 67). Exchange the mechanical module. Exchange the CIS. Faulty CIS
Black lines when printing.	Dirty CIS or roller Faulty TPH or CIS	Test: function 86 (Printer test) function 67 (Print scanref) Clean or exchange CIS. Exchange the mechanical module.
During conversation from an ext. phone the machine switches to fax reception.	You have paused too long during conversation.	Increase silence detection time or switch it off. (NCU 3F)
No display	No power	Check if the PGU output is 24V. Check connections between PGU, FCU and OPU Exchange PGU/FCU/OPU.
Ring count which can be adjusted by the user is not correct eg.: ring out setting: 3 rings but machine rings 6 times.	Double ringer. Machine detects each part of the ringing signal. eg.:fax counts 1 2 3 4 5 6 should be 1 2 3	Set NCU 04 to 100
No connection within a PABX.	TIME/EARTH-Break setting is not correct.	Check the setting in function 14.
When a number was dialed from an ext. phone, the machine goes on the line.	It's possible when the ext. phone works with pulse dial that a device which is connected on the same telephone plug rings, too. The machine interprets this is an incoming ring and goes on line.	Set NCU 05 to 010
No regular operation with ext. TAM.		The HFC21 must have first priority in the telephone line. Set the ring count of the HFC21 higher than the ring count of the ext. TAM.
External devices don't work.		Set external phone (Function 33).
User has forgotten the USAGE CODE.		Enter BE8E (Function 17: Usage code) B=R-key+1, E=R-key+4
Dialling does not work.		If dialling without connected to mains is working the LIU is OK, otherwise exchange the LIU. (only I / UK - power down)

11 TECHNICAL DATA

11.1 SPECIFICATION

11.1.1 General specifications

Items	Specification
Type	Desk-top type, transceiver (Half duplex)
Telephone circuit	PSTN with most common PABX
Input document size	1. Width: 148 - 217mm 2. Length: 105 - 600mm 3. Thickness: 0.05 - 0.15mm
Scanning method	Contact Image Sensor (CIS)
Printing method	Thermal printing
Recording paper	1. 210 mm x 30 m - with paper adjustment part 2. 216 mm x 30 m roll diameter < 53 mm
Recording paper feed	Manual paper feed

11.1.2 Communication quality

Items	Specification
Maximum time/line	TX 10ms/line RX standard: 20 ms/line detail: 10 ms/line
Protocol	ITU T30 binary
Date compression method	MH, MR coding
Modulation method	1. Message: V29, V27ter 2. Protocol: V21
Data transmission speed	9600 / 7200 / 4800 / 2400 bps, automatic shift down
Sequence of protocol signal	NSF —> CSI —> DIS
Transmission time	Chart: ITU #1 Resolution: Standard Bit rate: 9600 BPS Protocol time: excluded
Protocol time	Conforms to ITU T30 / T30

11.1.3 Scanning quality

Items	Specification
Max. scanning width	216mm ± 1mm
Valid scanning width	210mm ± 1mm
Scanning length	Depends on document length, max. 600mm Invalid scanning area top of page: max. 4.6mm bottom margin: max. 4mm
Threshold level	dynamically controlled with ABC
Resolution	8 pels / mm
1. Main scanning	1. Standard: 3.85 lines / mm
2. Sub scanning	2. Detail: 7.7 lines / mm
Colour response	**1. To read colour chart** a) 80% blue 100% of the area b) 80% red 100% of the area c) 80% violet 100% of the area d) 100% green 100% of the area (Drop out colour) **2. Not to read colour chart** a) yellow 100% b) PM-J 100%

11.1.4 Printing quality

Items	Specification
Thermal paper width	216mm ± 1mm
Valid printing width	210mm min.
Printing length	Depends on document length and density
Paper replace indication	flashing LED, error tone is generated (1 sec), display message (if available)

11.1.5 Copy quality

Items	Specification
Background density	Less than 0.12
Uneven density	Less than 0,3 (Macbeth densitymeter)
Reduction and enlargement	Main scanning: 1±1% Sub scanning: 1±2%

11.1.6 Other features

Items	Specification
Voice request	Voice request at the end of communication is in accordance with the ITU T30 protocol. (User has to lift the handset before end of communication.)
Automatic starting	TEL/FAX-mode: When the machine detects a CNG signal reception starts automatically. Else the machine starts receiving after the programmed ring counts.
Manual starting	Transmission starts when manual operation is performed (start key).
Copy mode	Copy operation is possible, using internal scanner and printer.
Time indicator 1. Time accuracy 2. Clock adjustment	 ± 4 min/month Possible to adjust the time using operation panel.
Power save mode	Less than 2W - Power save after 2min.

11.1.7 Audible alarm

Items	Specification
Continuous sound (3 sec.)	Error LED is flashing.
Continuous sound (1 sec.)	End of communication. With fax reception not necessary
Discrete sound (22 sec., on/off: 1/1 sec.)	Handset off-hook
Key confirmation	Confirmation of key press ACK tone (60 msec.) - 2kHz NAK tone (4x20 msec.) - 2kHz

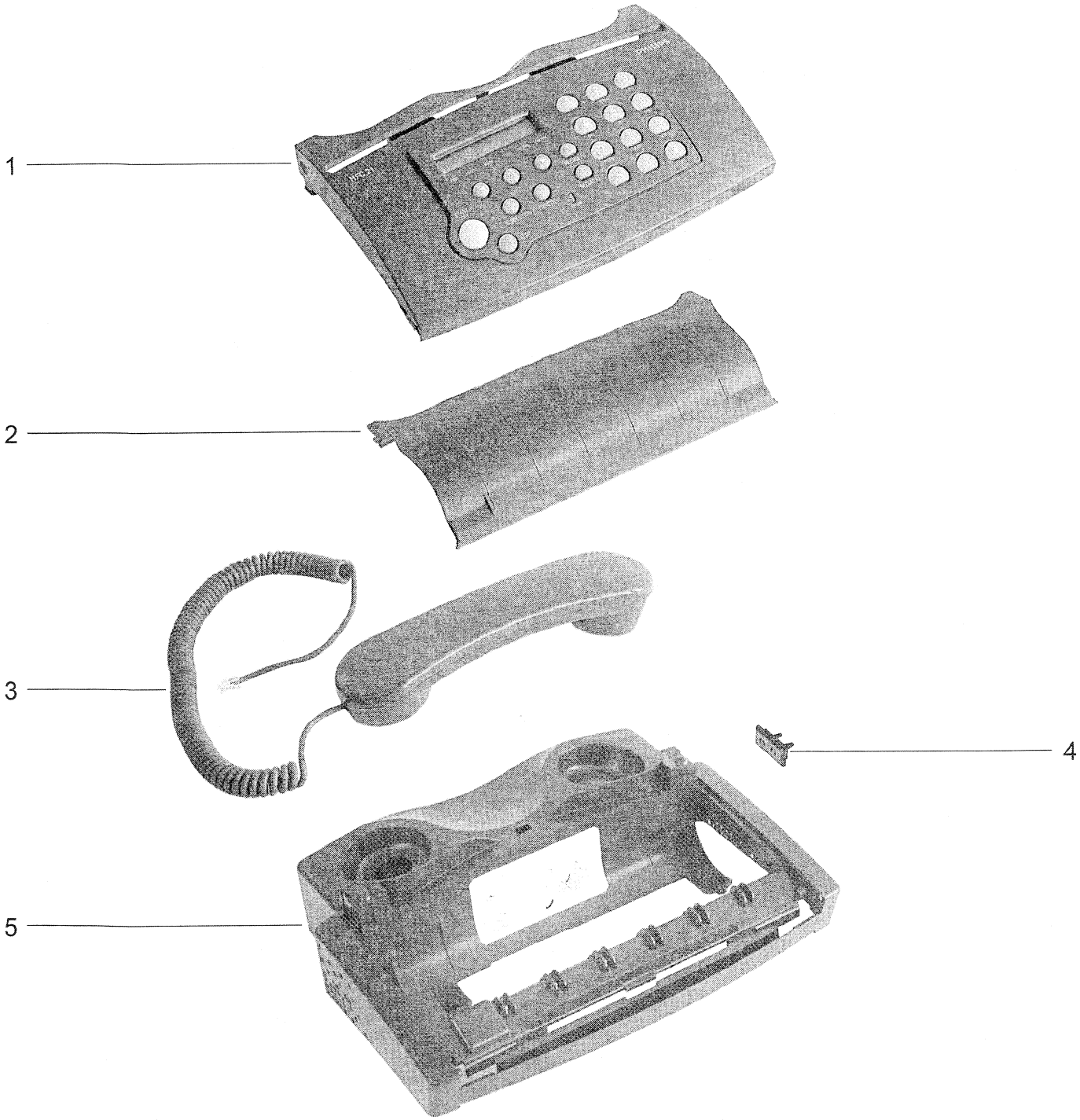
IV APPENDIX

In this Chapter you can find

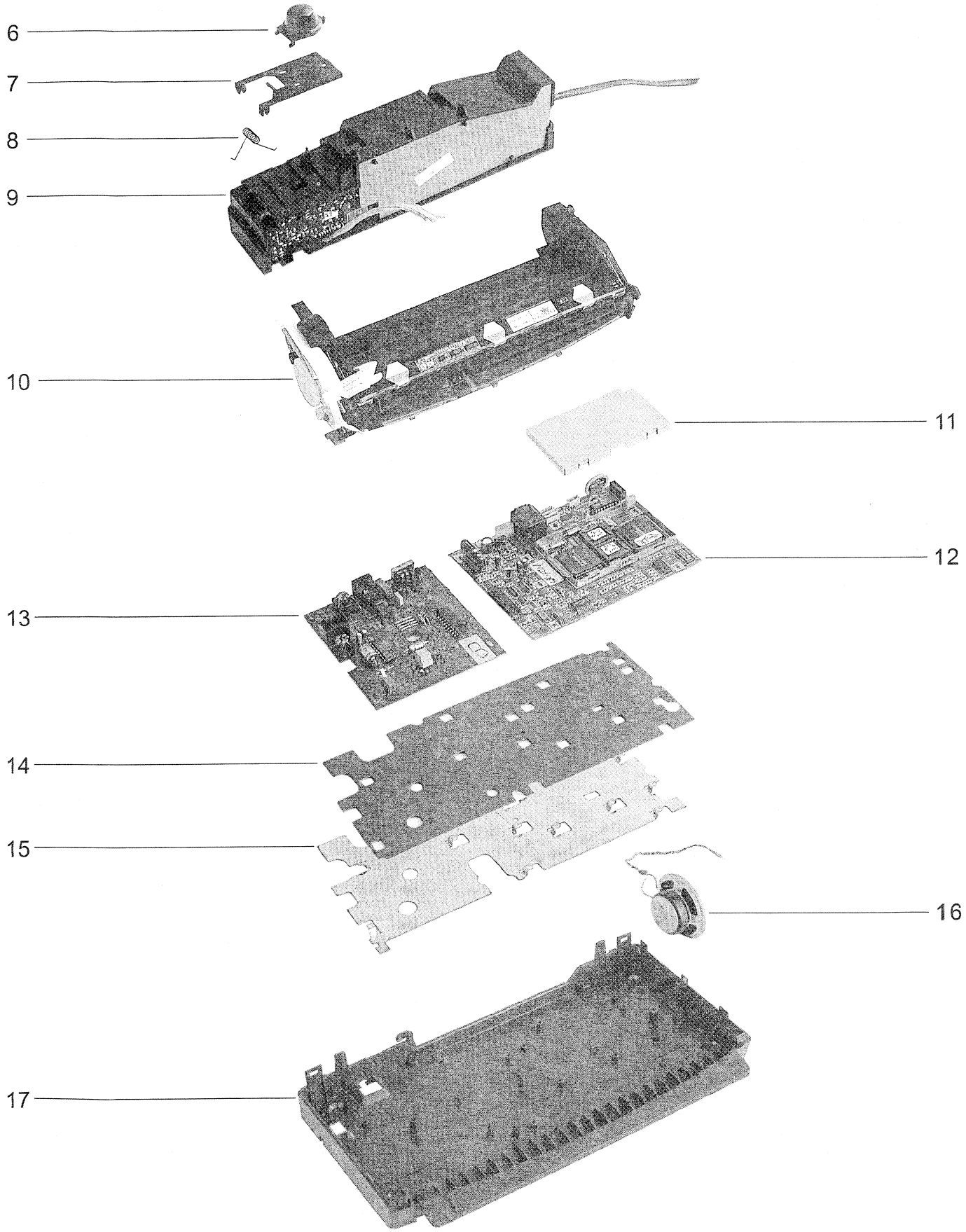
- Illustrated Service Parts lists for all countries
- Short Cuts from the Manual with their short description
- Index register

12 PARTSLIST

12.1 MECHANICAL AND ELECTRICAL PARTS



Nr.:	Description	Remark	Service Code
1	Front panel-D		4822 459 04356
1	Front panel-UK		4822 459 04357
1	Front panel-F		4822 459 04358
2	Paper guide		4822 466 11362
3	Handset + cord		4822 447 10571
4	Distance plate		4822 466 11363
5	Top cover		4822 442 00617


6
7
8
9
10
11
12
13
14
15
16
17

Nr.:	Description	Remark	Service Code
6	Hookswitch crucible		4822 402 10606
7	Hookswitch lever		4822 402 10605
8	Hookswitch spring		4822 492 11343
9	PGU		4822 218 11512
10	Mechanical module		4822 693 11233
11	Shielding plate FCU		4822 466 11365
12	FCU		4822 214 11914
12	FCU-NL		4822 214 11915
13	LIU-D		4822 214 11916
13	LIU-NL		4822 214 11917
13	LIU-UK		4822 214 11918
13	LIU-CH		4822 214 11919
13	LIU-I		4822 214 11921
13	LIU-A		4822 214 11922
13	LIU-B		4822 214 11923
13	LIU-S		4822 214 11924
13	LIU-E		4822 214 11925
13	LIU-F		4822 214 11926
14	Isolation plate		4822 466 11366
15	Bottom shielding		4822 466 11367
16	Loudspeaker		4822 240 30763
17	Bottom cover		4822 442 00618

12.2 CABLES

Nr.:	Description	Remark	Service Code
	Cable-19p (FCU-LIU)		4822 320 11679
	Telephone cable-D		4822 321 63014
	Telephone cable-NL		4822 321 62431
	Telephone cable-UK		4822 320 11324
	Telephone cable-CH		4822 321 61167
	Telephone cable-I		4822 321 62493
	Telephone cable-A		4822 321 62492
	Telephone cable-B		4822 321 61401
	Telephone cable-S		4822 321 62494
	Telephone cable-E		4822 320 11326
	Telephone cable-F		4822 321 62049

12.3 MANUALS

Nr.:	Description	Remark	Service Code
	User Manual-D		4822 736 14693
	User Manual-NL		4822 736 14694
	User Manual-UK		4822 736 14695
	User Manual-CH+B		4822 736 14696
	User Manual-I		4822 736 14697
	User Manual-S		4822 736 14698
	User Manual-E		4822 736 14699
	User Manual-F		4822 736 14701

12.4 SOFTWARE

Nr.:	Description	Remark	Service Code
	ROM set 330-D/UK/CH/I/A/F		4822 209 15005
	ROM set 311-D/UK/CH/I/A/F		4822 209 15006
	ROM set 330-NL/B/E/F		4822 209 15007
	ROM set 311-NL/B/E/F		4822 209 15008
	ROM set 330-S		4822 209 15009
	ROM set 311-S		4822 209 15011

12.5 ESD-EQUIPMENT

Nr.:	Description	Remark	Service Code
	Anti static table mat large		4822 466 10953
	Anti static table mat small		4822 466 10958
	Anti static wrist band		4822 395 10223
	Connection box		4822 320 11307
	Extendible cable		4822 320 11305
	Connecting cable		4822 320 11306
	Earth cable		4822 320 11308
	Complete kit ESD3		4822 310 10671
	Wristband tester		4822 344 13999

13 GLOSSAR

ABC	Automatic Background Control
ACK	Acknowledge
AM	Amplitude Modulation
AVM	Auto Voice Message
bps	bits per second
BSW	Bitswitch
BT	British Telecom
CCD	Charge Coupled Device
CE	Consumer Electronic
CED	Called
CFR	Confirmation to Receive
CIS	Contact Image Sensor
CNG	Calling
CRP	Command Repeat
CSI	Called Subscriber Identification
DCN	Disconnect
DCS	Digital Command Signal
DEC	Decimal
DIS	Digital Identification Signal
DTMF	Dual Tone Multiple Frequency
EOM	End Of Message
EOP	End Of Procedure
ESD	Electrostatic Discharge
FAX	Facsimile
FCB	Fax Control Board
FCC	Flex Coiled Cable
FCF	Fax Control Field
FCU	Fax Control Unit
FM	Frequency Modulation
FSK	Frequency Shift Keying
FTT	Failure To Train
HDLC	High Level Data Link Control
HEX	Hexadezimal
ICM	Incoming Message
ICR	Incoming Ring
ITU	International Telecommunication Union (former CCITT)
LIU	Line Interface Unit
LCD	Liquid Crystal Display
MCF	Message Confirmation
MCL	Mercury Communications Limited
MHC	Modified Huffman Code
MODEM	Modulator/Demodulator
MPS	Multi Page Signal
MRC	Modified Read Code
NAK	Not Acknowledge
NCU	Network Control Unit
NSF	Non Standard Facilities
NSS	Non Standard Facilities Set-up
OPU	Operation Panel Unit
OTPROM	One Time Programmable ROM
P	Page
PABX	Private Automatic Branch Exchange
PCB	Printed Circuit Board
PIN	Procedure Interrupt Negative
PIP	Procedure Interrupt Positive
PM	Phase Modulation
POTS	Power Off Telephone System
ppm	parts per million
QAM	Quadrature Amplitude Modulation
RB	Ring Back

READ	Relative Element Address Designate
RTN	Retrain Negative
RTP	Retrain Positive
RX	Receive
SDI	Sensor Document In
SGP	Sensor Gear Position
SHC	Sensor Hook Cradle
SMPS	Switched Mode Power Supply
SOP	Sensor Out of Paper
SSB	Sensor Board
SW	Software
TCF	Training Check Field
TPH	Thermal Printer Head
TSI	Transmitting Subscriber Identification
TTI	Transmit Terminal Identification
TX	Transmit

14 INDEX

A

AC input conditions 3-14
Adjustments 2-5, 2-6
Audible alarm 3-23
Automatic background control 1-16
Automatic redial 1-13

B

Block diagram 3-8, 3-11
BSW
  features 1-18
  functions 2-5, 2-10
  listing 2-17
  system report 2-9
Busy 1-20

C

Change memory 2-5, 2-11
Circuit description 3-12
CIS
  electrical 1-3
  mechanical 1-4
Clock
  adjustment 1-18
  generation 3-9
CNG 3-12
Communication quality 3-21
Compression methods 1-16
Connectors
  FCU 3-9
  LIU 3-11
  wiring 3-7
Copy
  mode 1-18
  quality 3-22
Country
  codes 2-16
  detection 3-12
CSI **1-16**
Current settings 2-3

D

Datacompression 1-5
DC output characteristics 3-14
DCN 3-17
DCS 3-17
Demodulation 1-5
Dialtone 2-17, 2-22, 3-19
Digital ringer volume control 3-10
Document jam 3-19
DTMF 2-5, 2-6, 2-14

E

EMI 3-15
Error
  codes 3-17
  messages 3-19
  report 1-17
ESD 1-2
External phone 2-4, 3-12

F

Factory adjust 2-5, 2-7
FAX switch 1-12
  EXT - mode 1-15
  TEL - mode 1-15
  TEL/FAX - mode 1-15
FCU
  description 3-9
  remove 3-6
Features 1-12, 3-9, 3-11
Frequency check 2-5, 2-7
Function list 1-17, 2-2

G

G1(T2) 1-5
G2(T3) 1-5
G3(V27) 1-5, 1-7
General tests 2-6, 2-12

H

Half speed transmission 1-14
Hookswitch 3-3

I

Input/Output levels 2-22
ITU-T 1-3

K

KEY Test 2-12
Keyboard 3-13

L

Language 1-18, 2-4
LCD 2-12, 3-13
LED 2-12
Line
  disconnect 3-17
  timeout 3-18
LIU
  description 3-11
  parameter 1-17, 1-18, 2-13
  remove 3-6
  system report 2-9
Loop current detection 2-17, 2-21, 3-19
Loudspeaker amplifier 3-10

M

Manual redial 1-13
Mechanical module 3-5
Memory 1-17, 1-18, 2-11, 3-9
Mercury 2-4
Miscellaneous 2-19, 2-20, 2-23
Modem
  interface 3-10
  test 2-6
Modulation 1-5

N

NCU
  features 1-18
  functions 2-5, 2-10
  listing 2-21
  system report 2-9

O

Operation elements 1-19
OPU
  description 3-13
  remove 3-4
OTPROM 2-16
Out of paper 3-19
Output
  level 2-5, 2-7
  protections 3-14

P

PABX 2-4
Page header 1-16, 2-4
Paper save 2-4
Paperguide 3-4
Parallel phone detection 3-12
Partslist 4-2
PGU
  description 3-13
  remove 3-3
Phone chip 3-12
Pixel 1-3
Polled reception 2-4
Power
  down 1-13
  fail 3-15
  save 1-18, 3-10, 3-14
  supply 3-9
Print
  memory 2-5, 2-11
  scanref 2-5, 2-8
Printer
  interface 3-9
  quality 3-22
  test 2-13
Problem list 3-20
Protection circuits 3-13
Protocol-signals 1-9
Pulse 1-13, 2-14

R

RAM test 2-12
Recall 1-13
Reception
  automatic 1-14
  manual 1-14
  polling 1-14
Reconfigure 2-5, 2-9
Redial 3-19
Reliability 3-15
Remote
  diagnostics 1-18
  fax start 1-15
  operation 2-4
Reset circuit 3-9
Ring
  back 1-15
  count 2-4
  detection 2-17, 2-21, 3-12
  volume control 1-13

S

Safety
  precautions 1-2
  requirements 3-15
Scanner
  adjust 2-8
  adjustment 2-5
  interface 3-9
  quality 3-22
  reference line 1-17
Sensor interface 3-10
Service
  BSW listing 2-18
  features 1-18
  functions 2-3, 2-5
  mode 2-5
  report 1-17, 2-5, 3-16
SGP 3-10
SHC 3-10
Speaker Test 2-13
Specification 3-21
Stepper driver 3-10
Sub addresses 1-14
System report 1-17, 2-5, 2-9

T

Tel unit 2-6, 2-13
Timeout 3-17
Tone 1-13
Top cover 3-2
Transmission 1-10, 1-11, 1-14
  automatic 1-14
  error 3-19
  features 1-14
  manual 1-14
  modes 1-16
  report 1-17
TSI 1-16
TTI 1-16

U

Undervoltage detection 3-14
Usage code 1-13, 2-4, 2-20
User functions
  Communication 2-4
  Faxswitch 2-4
  Others 2-4
User interface 2-18, 2-23

V

Video signal 1-4
Voice request 1-14

W

Wiring 3-7